SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

GEORGE H. HORN.

GEORGE HENRY HORN was born in Philadelphia, April 7, 1840, and died at Beesley's Point, N. J., November 24, 1897. He was stricken with apoplexy in December, 1896, resulting in hemiplegia, and thereafter passed most of the time, until his death, at or near the seashore.

Dr. Horn received his preliminary education in the Jefferson Boys' Grammar School, and from this entered the Central High School of Philadelphia, July, 1853. He graduated February 11, 1858, with the degree of Bachelor of Arts, and received his Master's degree from the same institution in July, 1863. He entered the University of Pennsylvania as a medical student soon after receiving his first degree from the High School, and received the degree of M. D. in 1861, his graduating thesis being on 'Sprains.'

The patriotic young physician enlisted in the U. S. Army in 1863 and received a commission as Assistant Surgeon, March 1st, of that year. He was first attached to the Second California Cavalry, Department of Pacific, until July 14th of the following year, then commissioned as Surgeon to the First California Infantry Volunteers, retaining this position until the term of service of this regiment expired, December 3, 1864. He was again mustered into service May 22, 1865, as Assistant Surgeon of his old regiment, the Second California Cavalry,

and was commissioned as Surgeon of the Second California Infantry, September 23, 1865. His services terminated with that of the staff of his regiment, April 16, 1866.

In the course of his service he spent some time in California, Arizona and New Mexico, in territory which was at that time almost unknown to collectors or students of Coleoptera, or, indeed, any order of insects. From the beginning Dr. Horn had been interested in natural history, and his tastes in this direction had been encouraged and stimulated by some of his teachers in the High School. The opportunity given by his service in these unknown territories was not neglected, and large collections of insects, principally Coleoptera, were made. In the course of his collecting he met with many ludicrous and some dangerous experiences; but he gradually interested many of the soldiers in his work, and some of the rarities in his collection were taken, according to his statements, by privates who picked them up and brought them to him. This was the most extensive field experience gained by the doctor, and throughout his life he was always much more interested in the fauna of this particular territory than in that of any other. His familiarity with the region and the peculiar difficulties of collecting in it led him to attach unusual interest and value to specimens originating there, and, as a result, his collection was most complete for this particular fauna. Dr. Horn was naturally an original student, and began his work in Entomology in 1860, even before graduating from the Medical School. Yet his first paper was on Molluscs, not insects, though his first descriptions of new Coleoptera appeared only a few months later.

On his return to Philadelphia he established himself as a physician, with an office at the then residence of his father, at the corner of Fourth and Poplar streets, and this office he retained until his death, although for some time previously he had not been practicing. When he began work his father, Mr. Philip Horn, carried on business as a druggist, and back of the store the doctor had a little room for consultations. This also he retained long after the drug business had passed out of his father's hands.

The neighborhood in which the doctor settled was a populous one, and he soon began to make a specialty of the diseases of women and children, gradually acquiring a large obstetrical practice, and being often called in consultation in difficult or unusual cases.

Dr. Horn never married, and much of his time, when not actually engaged in the outside business of his profession, was passed in a large room on the second floor, in which he had an iron bedstead, two or three chairs, a huge desk, a small table or two, and shelves and cabinets wherever there was room to place them. The desk, except for a small space near the middle of one side, was always piled with books, papers and specimens in boxes of all kinds. The chairs were piled with material of the same character; the shelves and cabinets were filled to overflowing. When a visitor arrived whose entomological taste entitled him to admission to this apartment he either sat on the bed, or a chair was cleared for his accommodation. Not unusually, the bed was more or less filled with books and papers, and everything was always in such condition that scientific work could be resumed at a moment's notice whenever the doctor came in from a round of calls or had a few moments to spare during office hours. A physician in active practice does not have much time during the day, and in the special line in which Dr. Horn was engaged night calls are not infrequent; so that his hours of sleep were frequently more or less irregular and always scant. When no calls took him away he would work until midnight or long afterwards, over his collections. Almost

as a necessary consequence of the constant readiness of his room for work, it was forbidden to do any cleaning, except in the immediate vicinity of the bed. During the entire time that I was acquainted with Dr. Horn—and this was nearly eighteen years—I can remember no more than one occasion when the room had been actually swept and scrubbed in its entirety. When Dr. Horn began to give up active practice, several years ago, he ceased to sleep in this room, and it was not long before the bed was piled as high as the table with books, boxes and other literary or entomological material.

For many years Dr. Horn seemed to have no interest in life outside of his profession and his scientific work in Celeoptera. His collections in this order increased enormously, as did his knowledge; so that, even during the lifetime of Dr. Leconte, he was the man best acquainted with the structural characteristics of the North American Coleoptera.

It is almost impossible to speak of Dr. Horn without also referring to Dr. John L. Leconte, his fellow townsman, and for many years also his fellow worker in Coleoptera. Although at first there was some friction between him and the younger man, who was very positive in many cases where the older, more experienced student was inclined to be conservative, yet the two men soon became firm friends, and so continued during their joint lives. The combination was useful to both. Dr. Leconte was, by all odds, the broader man; his knowledge of nature at large was much wider, and he saw his specialty, the Coleoptera, much more truly in their relation to the other orders of insects, and this class in its relation to the rest of the animal kingdom. Dr. Horn was much more completely a specialist, with little interest outside of the Coleoptera, but in this knowledge of detail was infinitely greater, and the result of combining two such men appears in the Classification of the North American Coleoptera, which is their joint production. There is no other work which will compare with this in the amount of condensed strictly scientific, technical information on this order of insects. Unfortunately, these characters, which render it so valuable to the advanced student, rather repel than attract the tyro.

Dr. Horn was by nature an arranger of things. In his hands the most hopelessly mixed lot of specimens separated themselves naturally; he found characters where none had been suspected, and his appreciation of the value of apparently immaterial or insignificant structures resulted in some of the most brilliant work that he did. He had an almost intuitive perception, which enabled him to arrange a large mass of species in a natural series. He had also the power of persistent and practical application, the ability to do continuous hard work, which enabled him to give a solid scientific foundation to the conclusions that he had reached. He had a facile pencil, which he used in illustrating his work. His pictures were by no means artistic, for that faculty was to a great extent lacking; but somehow his drawings, even when they were mere outlines, seemed to convey the information that he intended they should, so that his sketches were always a real help.

It is difficult for one who is not a specialist to appreciate the work that was accomplished by Dr. Horn. The number of titles of papers published by him is not especially large. It does not exceed 240, all but six entomological, and in these about one hundred and fifty new genera and about fifteen hundred and fifty new species were described. But this does not fairly express the work that was accomplished, because, by all odds, the greater part of Dr. Horn's species and genera were described in connection with monographic work, so that while a paper might contain descriptions

of only one new genus or only a few new species it would yet contain descriptions of all the genera and all the species of a large group. He wrote few short papers and, as he never was an editor, was not compelled to supply 'fillers.' He believed in monographic work covering considerable groups, or at least a large genus, and rarely wrote critical or review notes. He was by no means a diffuse writer, and his papers are models of brevity, and of clear, succinct statement. His descriptions of species and genera have never been excelled, and one is rarely left in doubt as to which species the doctor had before him when writing. His monographic and revisional papers are almost all built with the evolutionary idea constantly in mind. The preliminary divisions are always made upon well defined structural characters, and around each type of structure its derivatives are grouped. His belief was that species are not isolated facts or productions, but that they are parts of a great scheme, which it is the work of the systematist to unravel. Species are the products of their surroundings, and each species consists of an aggregation of individuals. No one specimen, to his mind, ever could represent a species. It required at least a male and a female, and a proper definition of a species is one that would include also all the variations of both sexes; therefore, Dr. Horn never had a 'type' specimen, because he did not admit that any individual could be a type of a species. The species consists of a certain combination of characters; all the individuals containing this combination of characters are equally types of the species; therefore, there was not anywhere in his collections any individual marked as a type of any species described by him. In fact, Dr. Horn never considered the individual; to him it was simply an evidence of the existence of a certain combination of structures, and no more. A well-known Coleopterist has compared Dr. Horn's description of species to an excellent portrait whose likeness to the original is so great as to be recognizable at the first glance.

While the most of the work done by Dr. Horn referred to the North American fauna, he was yet well acquainted with the general character of the Coleopterous fauna of the world at large, and in his most notable papers he considered our own species and genera in comparison with those of other countries. The two papers which effectually fixed his place in the first rank of workers in entomology were his 'Genera of Carabidæ,' published in 1881, and his paper on 'The Silphidæ,' printed in 1880. The first cited was the most brilliant of the two; the second required much the more painstaking labor. Both of these have been accepted by all students of this order.

Dr. Horn's influence upon Colepterological work in North America has been so great that almost all the present students are following his methods wherever they are doing similar work. He was a 'closet naturalist,' a worker with dry specimens; he never dealt with microtomes or sections, and considered life histories of subordinate importance, though necessary to a complete understanding of the insects in all cases. Nevertheless, his work will always stand as a contribution to knowledge, because it is original, accurate, and, with a vital meaning so far as it goes. It will stand the test of time and of critical examination in the future, for it is well done.

His rank and standing were recognized in foreign countries, some of which he visited several times to familiarize himself with their best collections, as well as in America. He was an honorary member of the Societié Entomologique de Belgique, of the Societé Entomologique de France, and of the Entomologischer Verein in Stettin; an active member of the Societas Entomo-

logica Rossica, and a corresponding member of most of the other foreign societies as well as of the k. k. Zoölogische-Botanische Gesellschaft in Wien. He was an honorary member of most of the American entomological societies, and a corresponding member of many other natural history societies throughout the country.

From an early date he was connected with the Academy of Natural Sciences in Philadelphia, where he held the office of Corresponding Secretary for fourteen years, and was a member of Council and of the Finance and Publication Committees for long periods of time. He was also a prominent member of the American Philosophical Society, in which he was Secretary and Librarian at the time of his death. In the American Entomological Society he was always a leading member, succeeding Dr. Leconte as President in 1883, and he was also Director of the Entomological Section of the Academy of Natural Sciences. In 1889 he was appointed professor of entomology at the University of Pennsylvania; but the position was a purely honorary one, and he did not teach or lecture.

Personally he was a good friend and a genial companion. While not in any sense a 'social' man, he could at times relax completely and act as though no such science as entomology existed. It is more than probable that his intense and continuous application and the nervous tension induced by it contributed to his death. That the doctor himself realized that he was doing too much is proved by the fact that for several years he had gradually reduced his active practice, and finally gave it up entirely, to spend a large portion of the summer at least at the seashore. But the mischief had been done and the final blow was only a little delayed.

Entomological science can ill afford to lose a man of his calibre!

RUTGERS COLLEGE. JOHN B. SMITH.

PRESENTATION OF PROFESSOR MARSH'S COLLECTIONS TO YALE UNIVERSITY.

AT the meeting of the Yale Corporation, held on the 13th inst., O. C. Marsh, Professor of Paleontology, formally presented to the University the valuable scientific collections belonging to him, now deposited in the Peabody Museum. These collections, six in number, are in many respects the most extensive and valuable of any in this country, and have been brought together by Professor Marsh at great labor and expense, during the last thirty years. The paleontological collections are well known, and were mainly secured by Professor Marsh during his explorations in the Rocky Mountains. They include most of the type specimens he has described in his various publications. The collection of osteology and that of American archæology are also extensive and of great interest. The present value of all these collections makes this the most important gift to natural science that Yale has yet received.

At the same meeting the Yale Corporation accepted Professor Marsh's gift by a unanimous vote, and expressed their high appreciation of his generosity to the University.

Professor Marsh's letter accompanying his deed of gift is essentially as follows:

To the President and Fellows of Yale University.

GENTLEMEN: It is thirty years and more since Mr. George Peabody established at Yale, by a gift of one hundred and fifty thousand dollars, the Museum that now bears his name. This was in 1866, the year I began my work as Professor of Paleontology, and I secured this gift mainly with a view of building up a Department of Paleontology that should be a school of original research as well as one of instruction. The collections of natural history which I had thus brought together were subsequently deposited in the Peabody Museum, and from that time I have endeavored in every way to increase these collections, so that at present they are in many respects the most extensive and valuable in this country.

It has always been part of my plan that these scientific collections should eventually become the property of Yale University, and from the first I pro-

vided in my will for such a disposition of them. As it now seems probable that I may not be able to carry out my original intentions in regard to a Department of Paleontology at Yale, I have decided to present these collections to the University, subject only to certain conditions that appear necessary for their permanent care and preservation. The deed of gift, which I herewith enclose, bears the date of January 1st, 1898.

These various collections, now deposited in the Peabody Museum in New Haven, include six of special importance which may be briefly described as follows:

(1) *The Collection of Vertebrate Fossils.* This is the most important and valuable of all, as it is very extensive, contains a very large number of type specimens, many of them unique, and is widely known from the descriptions already published. In extinct Mammals, Birds and Reptiles, of North America, this series stands preëminent.

This collection was pronounced by Huxley, who examined it with care in 1876, to be surpassed by no other in the world. Darwin, in 1878, expressed a strong desire to visit America for the sole purpose of seeing this collection. Since then it has been more than doubled in size and value, and still holds first rank. The bulk of this collection has been secured in my western explorations, which have extended over a period of nearly thirty years, during which I have crossed the Rocky Mountains twenty-seven times.

(2) *The Collection of Fossil Footprints.* These specimens are mainly from the Connecticut Valley, and thus have a special local interest. They also form one of the most extensive and complete collections of the kind in this country, if not the most valuable of all.

(3) *The Collection of Invertebrate Fossils.* This includes a large number of interesting specimens from many formations and localities, both in this country and in Europe. Some of these fossils I collected myself, but the greater number were secured by purchase. Among the series of specimens especially valuable may be mentioned several thousand from the famous Mazon Creek locality in Illinois; a very extensive collection of Crinoids from Crawfordsville, in Indiana; the largest collection of nearly entire Trilobites yet discovered, and one of the rarest series of Silurian Sponges known, including important type specimens.

(4) *The Collection of Recent Osteology.* This is believed to be the most complete collection in this country for purposes of study. I have made special efforts for many years to secure the skeletons of rare existing vertebrates from every part of the world, particularly of Mammals, Birds and Reptiles. The collection is rich in Anthropoid Apes, the Gorillas being represented by no less than thirteen individuals, and the other genera by rare characteristic specimens.

(5) *The Collection of American Archæology and Ethnology.* This collection is the best in the country in several branches of the science, being particularly rich in Central American antiquities, several thousand specimens in number and many of them unique. Some of these I obtained myself in Central America, and among the others is the famous de Zeltner collection, rich in gold ornaments, which I secured by purchase. The specimens from Mexico are also of great interest, and the series is a representative one. It includes the well-known Skilton collection.

(6) *The Collection of Minerals.* This is a limited collection, but contains many valuable specimens, among them probably the most interesting series known of Nova Scotian Zeolites. These were mainly collected by myself, before I graduated at Yale, during six expeditions to Nova Scotia.

The three principal collections in the above series, numbered 1, 4 and 5, have practically no other representatives at Yale, and hence their importance to this institution.

Besides the six main collections named, I have several others of less value, which include fossil plants, casts of fossils, geological specimens and recent zoological material. These, also, are deposited in the Peabody Museum, and are covered by the present deed of gift.

* * * * * *

On learning of the acceptance of this gift on the part of the Corporation of Yale University, with the conditions stated in the accompanying deed, I will make the formal transfer to them of all the collections above named.

Very respectfully,

O. C. Marsh.

Yale University, January 1, 1898.

The conditions on which Professor Marsh gives his invaluable collections to Yale University, for the benefit of all departments of the University, are few in number, the more important being the following:

(1) The scientific collections I now give to Yale University shall be kept in the present Peabody Museum building or in additions thereto equally safe from fire.

(2) During my life, these collections shall remain, as now, under my supervision and control, available for my own investigation

and description, or for the work of others designated by me.

(3) At my decease, and forever after, these collections shall be under the charge of the Trustees of the Peabody Museum and their successors, and in the special custody of Curators recommended by them and appointed by the Corporation of Yale University.

(4) The type specimens and others of special importance in these collections shall not be removed from the Museum building. Less valuable specimens, however, especially duplicates, may be so removed by vote of the Trustees of the Museum.

From a scientific point of view, the value of the collections now presented to Yale is beyond price, each one containing many specimens that can never be duplicated, and already of historical interest in the annals of science.

Among the prominent features of one of these collections, that of extinct vertebrates, may be mentioned (1) the series of fossils illustrating the genealogy of the horse, as made out by Professor Marsh, and accepted by Huxley, who used it as the basis of his New York lectures; (2) the Birds with teeth, nearly two hundred individuals, described in Professor Marsh's well-known monograph 'Odontornithes;' (3) the gigantic Dinocerata, several hundred in number, Eocene mammals described in his monograph on this group; (4) the Brontotheridæ, huge Miocene mammals, some two hundred in number; (5) Pterodactyles, or flying dragons, over six hundred in number; (6) the Mosasaurs, or Cretaceous sea-serpents, represented by more than fifteen hundred individuals; (7) a large number of Dinosaurian reptiles, some of gigantic size. Besides there are various other groups of Mammals, Birds and Reptiles, most of them including unique specimens.

The resolutions of the Corporation of Yale University, accepting Professor Marsh's gift, and showing their appreciation of his services to the University, are given below:

YALE UNIVERSITY, January 13, 1898.

The President and Fellows having received a deed of gift from Professor Othniel C. Marsh, presenting to the University his very valuable collections now in the Peabody Museum, which represent the labor of many years on his part and also the expenditure of a large amount from his personal fortune, desire, as they accept the gift, to communicate to him and to place on record an expression of their grateful acknowledgment of his generosity.

In this grateful acknowledgment they are confident that all the graduates and friends of Yale will unite, when they learn of this most recent manifestation of his long-continued interest in the University, even as they already fully appreciate the unselfish devotion of his time, his talents and his energies, for more than thirty years, to the scientific researches which have given him such personal distinction and have brought such renown to the institution.

TIMOTHY DWIGHT,
President.

GEOLOGICAL SOCIETY OF AMERICA.

II.

Note on Lepidophloios Cliftonensis. SIR WILLIAM DAWSON, Montreal, Canada.

In the *Bulletin* of this Society for May, 1891, appeared a paper by the author on 'Fossils from the Carboniferous of Newfoundland,' including new species of *Lepidodendron* (*L. Murrayanium*). In connection with this species I noticed what seemed a closely allied form from New Brunswick, which I had named *L. Cliftonense*. Later studies of this species have shown me that it should should rather be placed in the allied genus *Lepidophloios*. I have so placed it in a more recent paper on the genus in the present year. It should, therefore, be named *Lepidophloios Cliftonensis*, but is one of the species of that genus nearest to *Lepidodendron*, and especially to my *L. Murrayanium* and to *L. Wortheni*, of Lesquereux, as I have already stated in the paper to which this note is an addendum and erratum.

The paper was read by the Secretary. In discussion David White referred to Sir William's long service in paleobotany, he having begun the study of fossil plants in 1843, at the same time with Ettingshausen and Geinitz.

Omphalophloios, a New Lepidodendroid Type. David White.

Mr. White described a Lepidodendron trunk that had been found in the Des Moines series (Lower Carboniferous), at Clinton, Mo. After a review of the forms of the common leaf-scars on Lepidodendrons and an explanation of their functions so far as understood, the peculiar features of the one in question were outlined. The paper requires cuts to make these clear. It was discussed by H. L. Fairchild.

The Mastodon in Western Ontario. H. M. Ami.

Mr. Ami described the exhuming of two mastodons in Ontario, one in Essex county, north of the west end of Lake Erie, and one in Norfolk county, at the east end of the same lake. In the former case the section of six to eight feet that was dug up involved the following from below upward, at the bottom clay and boulders; then gravel, the bones, sand and shell marl, sand and peat, gray sand, sand and ochre yellow sand. The remains were fragmentary. In Norfolk county the pit was three to four and one-half feet; at the base was clay; then shell marl, mottled sand, gray sand and peat. The skull extended from the clay through the others. In addition, 25 ribs, 40 feet-bones, 2 tusks and many vertebræ were recovered. In the peat deer-bones and arrow-heads were found.

Mastodon and Mammoth Remains found near Hudson Bay. Robert Bell, Ottawa, Canada.

The paper gave an account (1) of the discovery of some mastodon bones in 1877, near the junction of the Mattagomi and Missinaibi Rivers, to form the Moose River in the southern part of the basin of Hudson Bay, and described the superficial deposits in that region; and (2) of the finding of a peculiarly small mammoth's tooth on Long Island, off the Eastmain coast of Hudson Bay. It discussed the question of the specific identity of this small northern mammoth with the common species of more southern latitudes in North America.

The first mentioned specimen was discovered by an Indian, who chopped out a tooth from a skull lying in the river and then left the latter. The speaker passed the spot at high-water and could not secure the bones. The other was found on the bare rock.

Fossil-like Forms in the Sault Ste. Marie Sandstone. Robert Bell, Ottawa, Canada.

In the bottom of the pit which was excavated in the sandstone for the canal lock on the south side of the Sault Ste. Marie, in 1891, a bed was found covered with very distinct markings, which in some respects resemble large plant remains, but they are probably casts of desiccation cracks. The author's remarks were illustrated by photographs of four large specimens. The remains were surprisingly like fossils, but all present agreed with the speaker in their interpretation.

Syenite-porphyry Dikes in the Adirondack Region. Henry P. Cushing, Cleveland, O.

Recent field work in Clinton county, N. Y., has shown the existence of dikes belonging to the syenite-trachyte family of eruptive rocks, which are of different age from the bostonites described by Kemp and Marsters from the near vicinity. They are older than the Potsdam sandstone, as they have furnished pebbles to its basal conglomerate. On the other hand, the older rocks of the region were metamorphosed before their extrusion. Together with the associated diabases they show great resem-

blance to the Keweenawan eruptives of the Lake Superior region. They possess considerable petrographical interest.

Analyses which were given showed them to be rich in soda and of a composition that would lead one to infer the presence of nepheline, yet none could be detected by chemical or optical tests. The rocks attracted much interest from the petrographers present.

In discussion J. F. Kemp outlined briefly the area in the Champlain Valley in which the smaller dikes were found, stating that they practically ceased near Ticonderoga and were not known in the southwestern Adirondacks. J. P. Iddings mentioned the difficulty of giving an expressive name to the rocks and the curious position that they occupied.

Clastic Huronian Rocks of Western Ontario, and the Relation of Huronian to Laurentian. A. P. COLEMAN, Toronto, Canada.

The speaker had been led to observe and study the rocks in question while reporting on the gold districts north of Lake Superior for the Ontario government. He reviewed the work of Lawson, H. L. Smyth and others in connection with maps, and described especially the clastic rocks. The distribution of the Conchiching around dome-like areas of the Laurentian crystallines, he suggested, could be perhaps explained by dome-like upheavals or bulgings of the latter, the domes being located where the overlying burden of sediments was thinnest. It was suggested that the same explanation might be applied to mountains elsewhere.

In discussion Robert Bell reviewed the early work of the pioneer observers in the region, and differed from Professor Coleman in his interpretation. G. O. Smith stated that many contacts in the Huronian regions on the south were obscure, but that others were very plain and showed a basal conglomerate resting on the ancient granite. G. M. Dawson spoke of the importance and difficulty of discriminating between an intruded batholite and a supporting basement of older granite. A. E. Barlow briefly described the breccias, graywackes, quartzites and conglomerates on Lake Temiscaming, and insisted that Laurentian was now only a petrographical and not a time-term. In closing the discussion Dr. Coleman replied in a few words to the remarks that had been made.

The Grading of Mountain Slopes. W. M. DAVIS, Cambridge, Mass.

With the lantern Professor Davis threw on the screen a series of views of slopes in various mountain ranges and from areas of other topographic forms and brought out the idea that, unless sapping or some other undermining action is in progress, the surface reaches a slope or grade that expresses the balance established between the weathering forces and the resistance of the materials. This feature is quite pronounced and characteristic and is described by speaking of the slopes as 'graded.' The grades differ according to the materials involved, and the evenness of the 'grade' is largely a function of the time of exposure.

The Harvard Geographical Models. W. M. DAVIS, Cambridge, Mass.

The Harvard Geographical Models, designed by the author and constructed by Mr. G. C. Curtis, have been prepared for the purpose of giving systematic illustration of a number of geographical forms in their genetic relationship. Three of the series were described and exhibited by means of lantern slides. They represent a mountainous region descending to the sea; the same after depresssion, whereby the shore-line has become very irregular; the same after elevation, whereby a coastal plain has been added to the land area.

The Society then adjourned until the following day. In the evening a reception

was tendered the Fellows by Mrs. J. B. Porter and Mrs. F. D. Adams in the new McDonald mining laboratories of the University. Many of the faculty families and their friends in the city gathered to welcome the Fellows and a most enjoyable evening was passed. Everything that cordial hospitality could suggest was done for the visitors. The spacious laboratories and their elaborate equipment with machinery of actual working size excited everyone's admiration and should assist in an important way in developing the University and the Dominion.

On reassembling Thursday morning, at 10 a. m., the reading of papers was resumed.

Nodular Granite from Pine Lake, Ontario. FRANK D. ADAMS, Montreal, Canada.

The paper described a granite from a recently surveyed portion of the Province of Ontario which in places contains an abundance of nodules scattered through it. These nodules differ in a marked manner from any of those occurring in the hitherto described nodular granites, among other things in being more acid in composition than the rock itself. They are frequently found to be arranged in long lines which, when followed up, coalesce into sheets having all the characters which are commonly presented by secondary quartzose veins. The phenomenon evidently results from a process of differentiation in the original magma and has an intimate bearing on the question of the origin of 'Contemporaneous Veins.'

Chemical Composition of the Granite from Pine Lake, Ontario. NEVIL N. EVANS, Montreal, Canada.

The analyses as given below proved that the cores of the nodules were more acid than the rims, a relation the reverse of that met elsewhere.

J. P. Iddings compared these nodules with spherulites in obsidian, and Whitman Cross brought out the lack of correspondence between them and the spherulitic phenomena with which he had become familiar. J. F. Kemp emphasized the contrasts with Craftsbury, Vt., 'prune' granite and the orbicular granite at Quonochontogue, R. I.

	Nodule.	Normal Granite.
Loss	0.92	0.32
SiO_2	81.43	78.83
Al_2O_3	13.70	10.88
Fe_2O_3	1.58	1.63
CaO	0.37	0.22
MgO	0.06	0.35
K_2O	1.28	5.31
Na_2O	1.02	2.13
	100.36	99.67

Experiments on the Flow of Rocks now being made at McGill University. FRANK D. ADAMS and JOHN T. NICHOLSON, Montreal, Canada.

The paper was presented by Dr. Adams and was illustrated by the lantern, by specimens of the results attained, and by a subsequent visit to the shops to see the machine. The authors have constructed a special crushing machine, much like the usual testing apparatus of engineering laboratories. Their object has been to subject cylinders of various rocks to pressures far above their crushing resistance, yet to confine them so that they could not shatter. After many unsuccessful trials of materials, strips of soft Swedish sheet iron were wrapped around a core of mild steel and welded together. The core was then bored out, the hole carefully polished and given a taper of one in a thousand. These cylinders were about $3\frac{1}{2}$–4 inches high and were turned down in the outer middle part so as to localize any bulging under pressure to this portion. They, therefore, looked like large spools, with thick ends. Cylinders of Carrara marble had meantime been prepared in Germany of the same taper as the holes and of such a size that, when the spools were heated and expanded,

the cylinders dropped snugly in and were caught midway of the spool. The cylinders of marble were about two centimeters in diameter. Chrome-steel plungers were employed in the squeeze, and fitted perfectly in the spools. By using the city water mains, which give at the University a pressure of 135 pounds to the square inch, oil was forced in beneath the piston of the press, and cylinder pressure gauges and a recording curve-tracing mechanism were connected. The blocks were gradually compressed until subjected to thirty tons' pressure. Under this squeeze the marble cylinder bulged at the middle, expanded its iron jacket and approximated a thick disc. When released it was found that it had flowed without losing its cohesion at all. When split down the vertical axis the cross section revealed two opposing paraboloids, or blunt cones of unchanged marble, filled in between with a dense, chalky variety, but all perfectly solid. Thin sections show a great abundance of twinning striations and gliding planes and evidences of strain. Cylinders of Baveno granite are now ready for experimentation, but have not yet been compressed. Peat has, however, been compressed into a black, shining and lustrous substance, very like high-grade lignite or coal, a result similar to that obtained abroad. Copper filings have been compacted also to solid metal. A further apparatus has been designed so that superheated steam can be introduced into the test, which can be kept at 500° F., for months at a stretch, while the compression is progressing, the gauges and recorder meantime registering the pressure at all times. Dr. Adams stated that two and a-half years had been spent in experimenting and six months in getting results.

The Fellows were outspoken in their praise of this work, and it was felt by all to be one of the most important contributions ever laid before the Society. It brings within the domain of experiment some of the obscure proceses of dynamic metamorphism and throws great light on the viscous flow of rocks.

The Geological versus the Petrographical Classification of Igneous Rocks. WHITMAN CROSS, Washington, D. C.

In this paper the aim was to show that much of the confusion in existing schemes for the classification of igneous rocks arises from wrong ideas as to the relations of petrography to geology. Suggestions were made which it is hoped will be useful both to the geologist and to the petrographer.

Dr. Cross presented a very thorough and philosophic review of the vexed question of nomenclature and classification. The distinction was made between petrography, the descriptive part of the subject, and petrology, the discussion of the at present more or less hypothetical or theoretical views regarding the splitting and variations of magmas, etc. Although no actual scheme was suggested, the general bearing of the paper tended toward the development of one that should give widespread satisfaction.

In discussion J. F. Kemp emphasized the importance of having the larger groups of a petrographical scheme, ones that can be used by the student, the mining engineer and by others engaged with rocks, whereas the finer determinations under these general, working groups might be left to the specialist. Such groups must depend solely on mineralogy and texture.

On the Classification of Igneous Rocks. JOS. P. IDDINGS, Chicago, Ill.

The paper involved a discussion of some general principles of classification with special reference to the chemical composition of rocks. The point of greatest interest in the paper was the extremely significant charts that Professor Iddings had prepared on the basis of over 900 analyses.

The ratios of the molecular equivalents of the alkalies to the silica were used as the ordinates, by which the dot indicating the particular analysis was located on the chart, while the actual silica percentages were employed as the abscissas. Very interesting and suggestive groupings of rocks resulted, and charts were shown that exhibited in a graphic way many peculiar points of composition.

Adjournment was then had for lunch. On re-assembling after lunch the following papers were read:

Concentric Weathering in Sedimentary Rocks. T. C. Hopkins, State College, Pa.; read by G. O. Smith.

The paper was a brief explanation of four photographs showing concentric structure in shale and fire-clay beds in western Pennsylvania. In some places they show a double concentric structure; one on a large scale, starting from the joint planes and resembling exfoliation; another on a smaller scale, showing flattened concretions of varying sizes.

New Geothermal Data from South Dakota, etc. N. H. Darton, Washington, D. C.; read by W. B. Scott.

By means of two large scale maps of South Dakota the curious variations in the temperature of the water from the artesian wells of the region were shown. All are warm, but the temperatures differ. Assuming that the temperature of the water indicates the temperature of the rock stratum that yields it, and using this in connection with the depth of the well and the mean annual temperature at the surface, very high rates of increase in depth are shown. They vary from an extreme of 18 feet for 1° F. west of the Missouri river to 35 feet for 1° F. at the last point recorded in eastern South Dakota. Belts were marked off according to the gradients 20–25 feet, 25–30 feet and 30–35 feet per degree. This developed a long, narrow east and west belt of relatively low gradient, projecting westward into the areas of higher gradient, and corresponding to the nearness to the surface of one of the lower geological formations. The maps are, however, necessary to make the relations clear.

Note on an Area of Compressed Structure in Western Indiana. George H. Ashley.

This paper was read by J. J. Stevenson. It emphasized the great lack of any evidences of disturbance throughout Indiana, as the geology of the State presents remarkable regularity of strata. Recently, however, the author had found near Asherville, in the block coal region, a great number of small faults, some even reversed, and cited them as evidence of local compression.

Niagara Gorge and St. David's Channel. Warren Upham, St. Paul, Minn.; read by T. C. Chamberlin.

Having recently again examined the Niagara falls and gorge, with especial reference to the older channel of St. David's, the author believes that a most important element in the history of the gorge erosion has been overlooked by some observers, and that by others its evidences have been misunderstood. This paper shows that the small preglacial stream which eroded the St. David's and Whirlpool channels, having a great depth beneath the river in the Whirlpool, must have flowed for a considerable distance, before reaching that depth, in a gradually widening and deepening ravine, coinciding with the present gorge along the Whirlpool rapids. Because the Niagara River found there a drift-filled narrow ravine, which is cut to the present size of the gorge, its erosion took place in that part by rapids and cascades. Southward from the head of the old ravine the river has eroded its gorge by a great vertical cataract, under which the masses of the Niagara limestone, rolled about by the

power of the waterfall, have worn the river bed to a maximum depth of nearly 200 feet beneath the water surface.

The narrowness of the gorge along the Whirlpool rapids is therefore attributed to the conditions of the river erosion here indicated, rather than to decrease of the volume of the river by diversion of the water of the upper lakes to flow from Lake Huron eastward. Studies of the glacial Lake Agassiz convince the author that the progress of the epeirogenic uplift of the northern United States and Canada from the Champlain depression was too rapid to accord with the hypothesis of any outflow from Lake Huron toward the east during the long time that would be required for the Niagara River, while thus diminished, to erode the gorge along the Whirlpool rapids. The explanation here given accords mainly with Dr. Julius Pohlman's discussion of the Niagara history, but differs concerning the age of the river and of postglacial time, which is estimated, as from Professor N. H. Winchell's discussion of the Falls of St. Anthony, to have been between 5,000 and 10,000 years.

The Princeton Expedition to Patagonia. W. B. SCOTT.

Professor Scott gave an outline of the remarkably rich finds made by the Princeton expedition, whose gatherings already amount to 20 tons and include 1,000 skulls. Mr. Hatcher is again on the ground and will remain three years. The results at present reached show that much revision is necessary of the Argentine stratigraphy as at present published. The lowest beds examined, constituting the Patagonian a marine formation, are Oligocene or lowest Miocene and are equivalent to the Miocene of New Zealand. The overlying Santa Cruz beds of volcanic ash, possibly lacustrine, are not older than the middle Miocene. The upper series or Cape Fairweather beds are Pliocene. All the fossils are in great contrast with those of North America, and the investigator finds himself in a new world. They show foreshadowings of the present South American types. Notwithstanding the incomplete stage of the investigation, many details were given by the speaker which were of the greatest interest to the Society.

The following papers were read by title:

Location and Form of a Drumlin at Barre Falls, Mass. WILLIAM H. NILES.

Drift Phenomena of the Puget Sound Basin. BAILEY WILLIS.

Notes on the Geology of the Rocky Mountains of Montana. WALTER H. WEED.

Weathering of Alnoite in Manheim, N. Y. C. H. SMYTH, JR.

On the Occurrence of Corundum in North Hastings, Ont. A. E. BARLOW.

The regular business of the meeting being concluded, the Society passed resolutions of thanks for the extremely hospitable reception that it had received from the resident Fellows, especially Professors Adams and Porter, and from the authorities of McGill, and then adjourned. In the evening the usual banquet was held in the Windsor Hotel and proved a very enjoyable conclusion of the exercises of the week.

All the visitors were greatly impressed by the new buildings and fine laboratories of McGill, and repeatedly expressed their appreciation and admiration for the gifts of Mr. McDonald, who has been largely responsible for the recent expansion. The advance of one university is a stimulus and an encouragement for all.

J. F. KEMP.

COLUMBIA UNIVERSITY.

IOWA ACADEMY OF SCIENCES.

THE twelfth annual session of the Iowa Academy of Sciences was held on December 27 and 28, 1897, with Professor T. H.

Macbride, of the State University, presiding. A goodly number of scientific workers of Iowa and adjoining States were present, among them Professor J. E. Todd, State Geologist of South Dakota; Mr. Frank Leverett, of the United States Geological Survey; Charles R. Keyes, former Assistant State Geologist of Iowa and later State Geologist of Missouri; Professor F. W. Sardeson, of the State University of Minnesota; Professors Calvin and Shimek, of the State University; Professors Weems, Osborn and Ball, of the State College at Ames; Professors Page, Arey, Newton and Mortland, of the State Normal School, Cedar Falls; Mr. R. I. Cratty, of Armstrong; Professor T. M. Blakeslee, of Des Moines College; J. L. Tilton, Indianola; L. S. Ross, Des Moines; W. S. Hendrixson, Grinnell, and others.

'Some Geometrical Generalizations,' by T. M. Blakeslee, was a discussion of a method whereby a number of geometrical theories could be put under one, itself a special case of a more general proposition, and hence more easily proven.

In the absence of Professors Combs and Pammel, papers on 'Comparative Histology of Corn Leaves' and 'Comparative Anatomy of the Fruit of Corn' were presented in summary by Professor C. R. Ball. The study was undertaken to determine, if possible, variations of structure that could be used in selection of varieties specially adapted to Iowa climate.

'Occurrence of *Termes flavipes* in Iowa,' by Herbert Osborn, noted the observation of the white ant, so common in Southern States, at LeClaire.

In a paper by Professor C. C. Nutting, 'Do the Lower Animals Reason?' the ground was taken that this faculty exists among lower members of the animal kingdom. In the discussion following the reading a number of instances supporting the views advanced in the paper were cited by different members.

Professor Herbert Osborn, in a paper, 'Additions to the List of Iowa Hemiptera,' enumerated ninety-seven species that had been hitherto unrecorded. Some of them were new to science, and two species that present striking mimicry and dimorphism were described in detail.

The same author, in 'Coccidæ Occuring in Iowa,' discussed the species of scale insects observed in the State, giving characteristics by which they might be recognized and calling special attention to the probability of introduction of the San José Scale, the means by which it is distributed, and the necessity for prompt recognition should it appear.

'The Hemipterous Fauna of Northwestern Iowa,' by the same author, presented results of a collecting trip in the northwestern counties and showing the occurrence in this area of species which belong properly to the plains of Nebraska and the Dakotas; also, some forms that occur normally in more southern localities, but seem to follow up the Missouri river; still others that are boreal in distribution, but that occur in the northwestern corner, and, so far as known, only in that part of Iowa.

The President's address, by Professor T. H. Macbride, of the State University, began with an interesting review of scientific work of the year past. Especial mention was made of the contributions by Iowa scientific workers, members of the Academy. This was followed by a prophetic outlook on the work that lies before Iowa scientific workers, the speaker giving unqualified commendation to those researches which result in practical value to mankind.

Professor B. Shimek read a paper on the 'Flora of the Sioux Quartzite in Iowa.' The researches presented, which form a continuation of those prosecuted in former years, resulted in the addition of a number of species. A comparison was drawn between conditions existing in June and

August, and the meeting of Eastern and Western flora in this region were discussed.

Professor T. H. Macbride read a paper on 'The Myxomycetes of the Black Hills.' These minute and interesting organisms which thrive in moist climates exist here under conditions that would seem very unfavorable. They are, however, much dwarfed as compared with those occurring in most localities in eastern Iowa, and, while affording an abundant variety, are such as would be recognized anywhere as very peculiar and poor.

'Idiocerus and Pediopsis,' by Herbert Osborn and E. D. Ball, included a discussion of generic affinities and species occurring in North America. Some of the species are abundant on various trees and of economic importance.

Papers by Professor Fitzpatrick on 'The Flora of Northeastern Iowa' and 'The Flora of Southern Iowa' were read by title.

What proved to be a very spirited discussion on the formation of the loess of the western part of the State and other portions of Iowa was opened by the paper of Professor B. Shimek on 'Is the Loess of Aqueous Origin?' followed by one on 'The Degradation of the Loess,' by Professor J. E. Todd, State Geologist of South Dakota. Professor Shimek presented a vast array of evidence, mainly from the occurrence and distribution of the mollusca, to support his view that parts at least of this formation could not have been deposited in water. The facts presented had been gathered with the greatest care, and the evidence most thoroughly sifted so that the conclusions must command wide attention.

Professor Todd presented numerous cases where the loess material gave evidence of creeping and ravining, and the formation of secondary deposits in which the determination of fossils became difficult.

Dr. C. R. Keyes presented a paper on 'The Carboniferous Formation of the Ozark Region,' embracing results of recent work and a statement of equivalent formations for different parts of the area.

Professor Calvin, in a paper on 'Some Anomalous Valleys and Paradoxical Divides in Delaware County, Iowa,' called attention to the peculiar habit, noted in the eastern part of the State, of streams turning aside from low plains to follow chasms cut in highlands that rise from forty to fifty feet above the plains from which the stream turned aside.

One of the most interesting features was a symposium on interglacial formations in Iowa, and participated in by Messrs. Calvin, Leverett, Bain, Udden and Fitzpatrick.

Professor Calvin opened with a discussion of the 'Interglacial Deposits of Northeastern Iowa,' describing the forest beds and gravel formations and discussing the significance of the gravels and the availability of the term Buchanan as a name for an interglacial stage.

In papers on 'The Weathered Zone (Sangamon) between the Iowan Loess and the Illinoisan Till Sheet' and 'The Weathered Zone (Yarmouth) between the Illinoisan and Kansan Till Sheets,' Mr. Leverett discussed the characteristics of the deposits and proposed names for each soil horizon. Mr. Bain considered 'The Aftonian Deposits of Southwestern Iowa,' locating typical exposures and presenting evidence to show that in southwestern Iowa there are cases of a drift sheet of unknown extent earlier than the Kansan and separated from it by an interval of unknown but considerable length. It is believed to represent one of the theoretical earlier and minor advances of the ice.

The paper by J. A. Udden, on 'Preglacial Peat Beds,' was a consideration of the peat beds and soils under all the drift and upon the rock surface.

Professor T. J. Fitzpatrick discussed 'The

Drift Section and Glacial Striæ in the Vicinity of Lamoni.'

The facts brought together in this symposium serve to clear up a number of debated questions relating to the glacial and interglacial deposits in Iowa, and must serve as a most substantial basis for any further studies of this interesting and important subject.

The following papers read by title were referred to the Secretary for publication in the Proceedings:

L. H. Pammel, J. R. Bumip and Hanna Thomas, 'Comparative Study of Berberidaceæ.'

L. H. Pammel, 'Notes on Fungi in Iowa for 1896–7.'

G. W. Carver, 'Notes on Fungi in Iowa for 1895–6.'

This meeting of the Academy was one of the best attended and most interesting in its history.

Its next annual meeting will be held in December, 1898.

The following officers were elected for the ensuing year: President, Professor T. H. Macbride, Iowa City; First Vice-President, Professor B. Fink, Fayette; Second Vice-President, Professor M. F. Arey, Cedar Falls; Secretary-Treasurer, Herbert Osborn, Ames; elective members of Executive Committee, Professors S. W. Beyer, Ames; A. C. Page, Cedar Falls; and W. H. Norton, Mt. Vernon.

Herbert Osborn.
Secretary.

CURRENT NOTES ON ANTHROPOLOGY.

THE PRE-MYCENÆAN CULTURE.

A score of years ago the early history of Greece was bounded by a Homeric fog, a thousand years or so B. C. Then came the brilliant researches of Schliemann at Hissarlik, Tiryns and Mycenæ, and the fog lifted to reveal the vivid and potent Mycenæan culture at its acme, about 1500 B. C. Now, once more, the clouds have rolled away, and investigations on the islands of the Archipelago and the mainland of Greece have disclosed to us, with abundant clearness, the 'pre-Mycenæan' culture, extending from about 2000 to 3000 B. C.

It is simple and rude, that of the Grecian folk before they had been touched by the Promethean fire which transformed them to the noblest artists of all time. The statues of stone are misshapen and incomplete; the pottery is generally coarse, and it is doubtful if its moulders knew the potter's wheel; its decoration is in lines and spirals only, animal figures being unknown; neither the sword nor gold had yet been discovered; tattooing was common; and the general condition was that of barbarism.

A full, well illustrated and instructive article on this culture is that of C. Blinkenberg, in the Memoires de la Sociétè Royale des Antiquaires du Nord, 1896.

CONTRIBUTIONS TO THE STUDY OF THE STONE AGE.

Professor Enrico H. Giglioli, of Florence, has recently published a number of interesting papers bearing on the industries of the stone age in various parts of the world.

In one he describes, from an unpublished MS., the stone age in New Caledonia as it now exists. It is in the neolithic stage, but the period is not far distant when it emerged from paleolithic types. Another article describes various stone implements still in use among the tribes of the Rio Napo, in South America. They are principally axes of various sizes and forms. Again, from Melaneria, he figures and describes the formidable maces of the natives of New Britain, made of hard wood, the end armed with a perforated stone, spheroidal in shape. Finally, in a note with several illustrations, he explains the use of the stone-armed threshing machine still a common implement in Tunisia. These and

other articles by Professor Giglioli are published in the *Archivio per l'Antropologia e l'Etnologia*, Florence.

D. G. BRINTON.
UNIVERSITY OF PENNSYLVANIA.

NOTES ON INORGANIC CHEMISTRY.

IN the *Comptes Rendus* the question of the identity of argon with nitrogen is taken up by H. Wilde, and the description given of an attempt to convert the spectrum of the one into that of the other. At a pressure of one millimeter and temperature of −76° the electric spark was passed through nitrogen for eight hours, but the spectrum remained unchanged. A negative result was also obtained when a strong spark was passed for eighteen hours through nitrogen at a pressure of twenty atmospheres. The spectrum of argon also remained unchanged by the passage of the spark at a pressure of three millimeters at a temperature of −76°.

THE work of Moissan on the metallic carbids and silicids has now been carried out, in conjunction with P. Williams, on the borids of the alkaline earths. Calcium borate, aluminum and carbon are heated together in the electric furnace. Calcium borid is obtained as a fine black powder which under the microscope consists of transparent, yellow, cubic crystals. They scratch the ruby, and are fusible at the temperature of the electric furnace. The crystals do not burn in the air until heated to redness; fluorin attacks them in the cold, chlorin at a red heat; hydrogen is without action at this temperature. Water is without action upon the crystals until a temperature of 1000° is reached. The fused borid is, however, acted upon by water with evolution of hydrogen. The borid has the formula CaB_6, but there seems to be a less stable borid with a smaller proportion of boron. The strontium and barium borids are similarly formed and possess analogous formulæ and properties. The borids of the alkaline earths thus do not fall in the same class with the carbids and silicids.

PROFESSOR MICHAELIS, of the University of Rostock, has published, in the last *Berichte*, the description of a considerable number of organic compounds of selenium, tellurium, antimony and bismuth. The tetrachlorids of selenium and tellurium unite with aromatic ethers, phenoles and ketones, giving products in which two atoms of chlorin are replaced by the organic radical. When the dichlorid of selenium is used, both chlorin atoms are replaced. The close analogy between selenium and tellurium is shown in these compounds. With antimony chlorid, anisol and phenetol react in benzene solution only in the presence of metallic sodium. Compounds of antimony with three and two anisyl groups are described, as well as a number of addition products in which the antimony is quintivalent. Analogous bismuth compounds are similarly formed. The whole work forms a valuable contribution to the relatively little known field of the compounds of organic radicals with the elements of higher atomic weight.

IN the above number of the *Berichte*, Melikoff and Pissarjewsky discuss the constitution of the salts of peruranic acid, which have been previously studied by Fairley. They consider the salts to have the formula $(R_2O_2)_2UO_4$, and to be compounds of the metallic peroxids with uranium tetroxid. By treatment with aluminum hydroxid they succeed in actually decomposing the salts into the peroxids and UO_4.

GEORG BERG has added to the number of 'complex acids' a compound of titanic acid with malic acid. As described in the *Zeitschrift für anorganische Chemie* it has the formula $2TiO_2.C_4H_6O_5$, $6H_2O$ and crystallizes in minute white prisms. When ammonia is led over it, three molecules of the water of crystallization are replaced by ammonia,

giving another instance of the chemical resemblance between H_2O and NH_3.

In the *Z. Ver. Rübenzucker-Industrie*, A. Herzfeld has a series of articles on lime (CaO) and its compounds. They refer largely to experiments carried out in a furnace of special construction for the purpose of solving the chemistry of lime making. Among other conclusions reached, we note that in the presence of superheated steam the complete burning of lime takes place at 200° lower than in air; that water will expel the carbon dioxid from all its compounds at 800°; and that the overburning of lime is occasioned almost exclusively by the presence of silica.

A new locality for Chili saltpeter has been discovered, according to H. Thoms, in the *Journal für Landwirtschaft*, in southwest Africa in the Kharas Mts. and on the Orange River. The mineral, known locally as Klipzweet, or Boomester, appears as an efflorescence on the rocks, and is used by the natives as a valuable remedy for many ills. Analysis shows it to contain chiefly sodium and potassium nitrates and chlorids, about three parts of sodium to one of potassium, and four parts of nitrate to one of chlorid; it may thus be considered to be an impure Chili saltpeter. No particulars are given as to its abundance, or possible economic importance.

J. L. H.

SCIENTIFIC NOTES AND NEWS.

THE MARINE BIOLOGICAL LABORATORY AT WOODS HOLL.

The winter meeting of the Trustees of the Marine Biological Laboratory was held in Boardman Hall, Cornell University, upon December 30th. Twelve members of the Board were present, including the President, Professor Osborn, of Columbia; the Secretary, Professor Bumpus, of Brown; Chairman of the Executive Committee, Dr. E. G. Gardiner, of Boston; Professor Clarke, of Williams; Professor Macfarlane, of Pennsylvania; Professor Penhallow, of McGill; Professor Metcalf, of Baltimore; Professor Patten, of Dartmouth; Professor Morgan, of Bryn Mawr; Professor Peck, of Williams; Professor Wilson, of Columbia; Professor Trelease, of St. Louis. Professor Conklin, of the University of Pennsylvania, was present at the preliminary conference held on Tuesday evening.

The Secretary reported that the Laboratory Prospectus for the summer session of 1898 had been prepared by the Director and was ready for distribution. This prospectus for the eleventh session of the Laboratory provides for the representation of nearly all the universities of the country in the corps of lecturers and instructors. Investigation in Zoology will be under the direction of Professors Ayers, Bumpus, Conklin, McMurrich, Metcalf, Morgan and Morrill. The embryological course will be under the direction of Dr. F. R. Lillie, of Michigan, assisted by Messrs. Strong, Crampton, Treadwell and Professor Clapp. The course in Anatomy will be under the direction of Professor Peck, of Williams, assisted by Messrs. Dahlgren, Greene, Lefevre, Murbach, Packard and Waite. The course in Physiology will be under the direction of Professor Loeb, of Chicago, assisted by Messrs. Norman and Lyon. The course in Botany will be under the direction of Professor Davis, of Chicago, assisted by Messrs. Moore, Caldwell, Harper, Fairchild, Webber, Swingle and Esten. The institutions represented in the whole staff are: Missouri, Brown, Pennsylvania, Michigan, Baltimore, Bryn Mawr, Hamilton, Columbia, Miami, Mt. Holyoke, Princeton, Leland Stanford Jr., Johns Hopkins, Detroit High School, Chicago, Harvard, Texas, Bradley Institute, Lake Forest, New York Experiment Station and the United States Department of Agriculture. Special seminars in Embryology and Neurology will be conducted by Drs. Conklin, Morrill and Strong. A course of historical lectures will be given by the Director and Drs. Wilson, Morgan, Wheeler, Watasé and Mall. Upon the list of regular evening lecturers upon General Biology are those who have already contributed to the regular evening course, together with some others. The course of instruction in

Scientific Drawing, by Dr. Arnold Graf, formerly a student of Professor Lang, will be continued in five lectures and demonstrations of all the various methods employed in the illustration of scientific works. The session will extend from June 29th to August 10th. A new feature of the embryological course is that the Director will associate with himself in the lectures a number of specialists in the different groups of vertebrate and invertebrate animals. This admirable prospectus for the coming season was heartily approved by the Trustees and ordered for distribution.

The Treasurer's report showed a balance of $838 to meet the initial expenses of the coming year, and directed attention to the fact that while many members of the corporation had not as yet paid their dues the expected income from this source will be ample to meet the initial expenditures.

Mr. Gardiner presented a written report to the corporation of the work of the Executive Committee since the last meeting of the Board in September, and recommended certain improvements in the Laboratory buildings at Woods Holl—which were approved. The matter of coöperation between the Laboratory and the United States Fish Commission was also discussed and referred to a special committee who will confer with the new Commissioner to be appointed by President McKinley. The preparation of the decennial report of the Laboratory, which will contain a historical notice, was also referred to the Executive Committee.

THE ESTABLISHMENT OF THE 'UNIVERSITY TABLE' AT NAPLES.

ONE of the most gratifying results of the Ithaca meeting was the hearty response given to Professor Anton Dohrn's offer to American naturalists in respect to the work at Naples, during his recent visit to this country, namely, that if three tables were established by America he would find places for as many students as came over from this country. For several months past efforts have been made to supplement the subscription of Mr. William E. Dodge, of New York, originally designated as a 'Half-year Columbia Table,' and establish what might be termed an 'American University Table' in distinction from the 'Smithsonian Table' and the proposed Table of American Colleges for Women. Mr. Dodge, upon the recommendation of Professor Osborn, had very liberally consented to drop the name 'Columbia' and continue his subscription under the general designation 'University.' At the business session of the Naturalists, as has been already noted in this JOURNAL, Professor T. H. Morgan brought forward the resolution to appropriate $100 from the Treasury of the Naturalists towards this University table, and this was unanimously approved. Upon the following day, at the meeting of the Trustees of the Marine Biological Laboratory, Professor H. C. Bumpus, promised to secure an addditional $100 upon behalf of the Marine Biological Laboratory and the Anatomical Laboratory of Brown University. He has promptly fulfilled this pledge, and the University table is now fully established for the present year at least, with the prospect of continuance. Inasmuch as Professor Bumpus has secured the $100 in the name of the Woods Holl Laboratory, it is eminently appropriate that the Laboratory should have a voice in the appointment of delegates to this table. This appears to be secured by the personnel of the Naples Committee, nominated by the Temporary Chairman, Professor Clarke, namely, Professor T. H. Morgan, Bryn Mawr; Professor H. F. Osborn, Columbia University; Dr. C. W. Stiles, Washington, D. C.; to either of whom applications may be made.

GENERAL.

THE agricultural appropriation bill, carrying $3,323,402, has been approved by the House of Representatives in committee of the whole. An amendment to strike out the appropriation of $130,000 for the free distribution of seeds was lost by a vote 19 to 155.

THE Director of the Geological Survey has been directed by Congressional resolution to prepare a map of Alaska showing all known topographic and geologic features, including the gold-bearing rocks, with a descriptive text, the text to include an explanation of the best known routes and methods of reaching the gold fields. 40,000 copies are to be printed.

A BILL will be brought before the next session of the British Parliament appropriating upwards of $15,000,000 for the rebuilding of South Kensington Museum.

MR. E. W. MAUNDER, Mr. C. Thwaites and the Rev. J. M. Bacon, with the parties under their direction sent by the British Astronomical Association for the observation of the total solar eclipse which occurs to-morrow, had, as we learn from the London *Times*, arrived at Bombay on January 4th The other observing parties had also arrived. The different observing stations will be as follows: Mr. Maunder and Mr. Thwaites will be stationed at Talni, on the Great Indian Peninsula Railway, between Amraoti and Nagpur; the Rev. J. M. Bacon at Baxar. Mr. W. H. Christie, the Astronomer Royal, and Professor H. H. Turner, forming the third official party sent out by the joint committee of the Royal Society and the Royal Astronomical Society, will be stationed at Sahdol, between Katni and Bilaspur. The observing party from the Government Observatory at Madras, under the direction of Professor Michie Smith, will be at Indapur.

MR. JACOB H. SCHIFF has given $10,000 to the New York Public Library for the purchase of scientific books.

A BRONZE statue of Charcot, by Falguière will be erected in the Saltpetrière, Paris.

WE learn from the *Auk* that Mr. George K. Cherrie has resigned his posision as assistant curator of ornithology in the Field Columbian Museum, and has sailed for Bolivar, Venezuela, which he proposes to make the base of exploration in the upper Orinoco region for the period of a year or more.

THE Academy of Sciences, Paris, has nominated as first choice M. Maquenne, and as second choice M. André as candidates for the chair of physiological botany in the Paris Museum of Natural History, vacant by the death of M. Georges Ville.

M. RENÉ CAGNAT has been made a member of the French Commission on Scientific Museums, in the place of the late M. du Courdray La Blanchère.

MM. BERTHELOT, Bourgeois, Fallières and Liard have been appointed members of the Council of the Paris Museum of Natural History, with M. Berthlelot as President.

IT is stated in *Nature* that Mr. George Sharman retired at the end of last year from the post of paleontologist to the Geological Survey of Great Britain, with which he had been connected since 1855.

DR. OTTO FINSCH has been appointed director of the ornithological division of the museum at Leiden, in succession to Dr. J. Büttikofer, who, as we announced sometime since, has accepted the directorship of the zoological garden at Rotterdam.

MR. WALTER SICHE, the traveler and florist, has, says *Knowledge*, returned from an expedition to the Cilician and Cappadocian Taurus, with a large number of alpine plants and ten thousand examples of various species of the asphodel family, with varieties of fritillary, galanthus, colchicum, iris and many other plants. Mr. Siche has been the means of introducing many new flowers to the domain of English horticulture.

THE Rev. Charles L. Dodson, from 1855 to 1881 mathematical lecturer at Oxford and the author of valuable contributions to mathematics and logic, has died at the age of sixty-six years. Mr. Dodson is known to every one as 'Lewis Carroll,' author of 'Alice in Wonderland' and other tales, which have delighted innumerable children and older people.

WE regret also to record the deaths of Sir Charles Hutton Gregory, an eminent English civil engineer, on January 10th, at the age of eighty-four; of Mr. Charles Cornevin, professor of hygiene and zoology at the Veterinary School at Lyons, and of Dr. Edward Lindeman, astronomer at the Observatory of Polkowa, aged fifty-three years.

THE National Geographic Society has announced for to-night a meeting in honor of the late Gardiner G. Hubbard, at the time of his death President of the Society. Mr. Alexander Graham Bell, will preside, and the program thus far arranged includes addresses by the following: Surgeon-General George M. Sternberg, U. S. A., on behalf of the joint scientific societies of the District; Dr. Philip G. Gillette,

on behalf of the American Association for Teaching Speech to the Deaf; Dr. B. L. Whitman, on behalf of the Columbian University; Dr. Marcus Benjamin, on behalf of the Society of Colonial Wars; W. L. Wilson, on behalf of the Smithsonian Institution; Mr. A. R. Spofford, Assistant Librarian of Congress, on behalf of the Columbia Historical Society; Major J. W. Powell, of the Bureau of Ethnology, and probably Commissioner Ross, representing the District. General A. W. Greely will close the meeting with a review of the ten years' work of the Geographic Society, representing the labors of Mr. Hubbard, its late President, during the latter years of his life.

THE British Institute of Public Health will in future be styled the Royal Institute of Public Heath. Queen Victoria has accepted the office of Patron of the Institute, and has conferred the Jubilee Medal upon the President, Professor W. R. Smith, M. D. The Council of the Institute has conferred the Harben Gold Medal for 1898 upon Lord Playfair, and has appointed Professor W. R. Smith, Harben Lecturer for the year 1899, and Mr. Henry C. Jones, Solicitor, Secretary to the Institute.

MR. DAVID HUNT, of Boston, has arranged to give four lectures on the 'History of Medicine,' at the Harvard Medical School, on Thursday evenings. The first of the series was given on January 11th, the subject being 'Hippocrates to the Sixteenth Century.'

AT a meeting of the Zoolgical Club of Springfield, Mass., on January 5th, Mr. W. W. Colburn was elected President, and Miss M. A. Young, Secretary. Dr. George Dimmock made a report on the card catalogue of the fauna of the region being prepared under the auspices of the Club. 1,940 species have been listed, the most complete portion being that on birds.

A LINCOLNSHIRE Science Society with several sections has been organized, with a view to advancing the interests of natural history and founding a museum in the county.

THE Nominating Committee of the Appalachian Mountain Club, Boston, has named Professor William H. Niles for President, Mr. Rest F. Curtis for Vice-President, Mr. R. B. Lawrence for Recording Secretary and Mr. John Richard, Jr., for Corresponding Secretary.

MR. VICTOR HORSLEY, the President-elect of the Neurological Society, London, gave his inaugural address at the annual meeting of the Society on January 13th. The subject of the the address was 'The Degree of Discharge of Different Nerve Centers.'

QUEEN VICTORIA has decided to convert the old palace at Kew, near the Botanic Gardens, into a public museum.

M. HOERST has applied to the city of Paris for permission to begin the construction of the colossal terrestrial globe to be erected under the direction of M. Elise Recluse for the Paris Exposition of 1900.

PROFESSOR NORDENSKJOLD, the Arctic explorer, has informed the Swedish Academy of Sciences that the Foreign Office has received intelligence that several persons worthy of credence saw Herr Andrée's balloon early in August, in British Columbia, seven miles north of Quesnelle Lake, in the district of Cariboa.

THE statements contained in the daily and other papers regarding the will of the late Alfred Nobel appear to be only partially correct. His personal estate in Great Britain has been valued at £434,093, but the amount set aside for the foundation of the five great prizes is not yet known. It will be remembered that according to the terms of the will the interest of the fund is to be divided into five equal parts, of which one part is to devolve upon him who, within the department of natural philosophy, has made the most important discovery or invention; one other part to him who has made the most important discovery or improvement in chemistry; one other part to him who has made the most important discovery within the department of physiology or medicine; one other part to him who in literature has produced the most excellent work in an idealistic direction; and one part to him who has worked most or best for the fraternization of the nations and for the abolition or diminution of standing armies, as also for the promotion and propagation of peace. The prizes in physics and chemistry are to be awarded by the Swedish Academy of Sciences, for physiological

or chemical work by the Carolinian Institution in Stockholm, for literature by the Academy in Stockholm, and for the propagation of peace by a committee of five persons to be elected by the Norwegian Parliament.

Chas. D. Walcott, Director of the U. S. Geological Survey, will have, in the next issue of *Appleton's Popular Science Monthly*, an article on 'The Preservation of our Forests,' and President David Starr Jordan an article on 'The Evolution of the Mind.'

With the January number *The Journal of School Geography* has been enlarged to 40 pages, and the editor, Professor Richard E. Dodge, Teachers' College, New York, announces that it will be improved in several ways. Particular attention will hereafter be given to mathematical geography, elementary meteorology and commercial geography. Mr. Andrew J. Herbetson Collington, Scotland, has become associate editor for Great Britain.

Three packages of yellow fever serum from Dr. J. Sanarelli, of the Institut de Hygiene Experimentale at Montevideo, have been received at New York, intended for Dr. Wyman, of the United States Marine Hospital service at Washington and for Dr. Doty. Part will be used in experiments made by Dr. Doty's assistant, Dr. C. B. Fitzpatrick, at the laboratory at Quarantine.

UNIVERSITY AND EDUCATIONAL NEWS.

At a meeting of the Corporation of Yale University on January 13th it was decided to appoint a committee to prepare plans for the proper celebration, in October, 1901, of the bicentennial anniversary of the granting of the charter to Yale College.

At a special meeting of the Council of Columbia University, on January 13th, action was taken as authorized by the Board of Trustees, incorporating the Teachers' College as a professional school for the training of teachers. President Low will become President of the Teachers' College, but the Trustees of the College will be continued as an independent board, responsible for the financial administration of the College. The Teachers' College was founded in 1887, Professor Nicholas Murray Butler, of Columbia University, being the first President. In 1893 the College was partially affiliated with Columbia University for educational purposes. The buildings of the College, erected at a cost of about $1,000,000 on land given by Mr. George W. Vanderbilt, are adjacent to those of Columbia University and Barnard College. The foundation of a professional school for the training of teachers of the same rank as university schools for medicine and law is one of the most important advances ever made in educational methods.

DISCUSSION AND CORRESPONDENCE.

A PROPOSED ADDITION TO PHYSIOGRAPHIC NOMENCLATURE.

The rocky mass of the earth, the lithosphere, is mantled in large part by formations whose particles or grains are loosely aggregated, either incoherent or feebly coherent. To these formations collectively Merrill has given the appropriate name *regolith* (stony mantle), a term approximately coördinate with lithosphere, hydrosphere and atmosphere. It was not proposed until its need had come to be distinctly recognized, and I believe it will be promptly adopted in geology and physiography. But a companion term is equally needed. The lithosphere is composed of rock, the hydrosphere of water and the atmosphere of air; of what does the regolith consist? There is no compact name for its material, although surface geology and physical geography have found occasion to mention it so frequently and under so many relations that there are plenty of descriptive phrases. Lying above the firm rock, it is *superficial* or *surficial material*. Having been formed by the breaking up of rock, it is *disintegrated material*. Because destined eventually to coalesce as rock, it is *unconsolidated material*. As a substitute for these binomial terms I propose the word *discrete*.

The adjective *discrete* comes to us along with *discreet*, from the Latin *discretus*, separate. *Discreet* is now appropriated by a secondary meaning, wise, but *discrete* means only separate, incoherent, discontinuous. In converting it into a technical noun I propose to retain this adjective meaning and add the idea of stony

material, making *discrete*=discontinuous stony material, or the material of the regolith.

Portions of the material of the regolith are already well named. Part of it is sedentary, the remainder transported. The sedentary portion has been called *geest* (Le Duc, McGee) and *saprolite* (Becker). The transported portion is sometimes broadly included under the term *drift*, but it is more commonly classified by genesis as *alluvium*, *glacial drift*, etc. *Discrete* is proposed to include all these.

It is proper to add that for many years I have personally felt the need of a succinct term for this idea, and that I have already made experimental use of the word *discrete* in two courses of lectures on physiography as well as in unpublished manuscript. Despite Dr. Branner's deprecation,* I cannot avoid the feeling that such tests, when critically applied, are of practical value, and I therefore venture to hope that the new word will be found useful by some of my colleagues in physiographic study.

After the writing of the preceding paragraphs my attention was directed to the fact that the noun *discrete* is already in print. It is used in the sense here proposed, but without definition, in a Johns Hopkins thesis by my friend Dr. A. C. Spencer.† G. K. GILBERT.

WASHINGTON, D. C.

HARVARD'S METEOROLOGICAL WORK ON THE WEST COAST OF SOUTH AMERICA.

TO THE EDITOR OF SCIENCE: In a previous communication on 'Meteorology in South America,' published in SCIENCE, October 1, 1897, pp. 523–525, the writer gave some facts as to the meteorological work now being done in Brazil and in the Argentine Republic. It would seem well to supplement the information given in that letter with some notes on what has been and is being done in Peruvian meteorology.

With the exception of the observations made at the 'Unanne' observatory in Lima, all the meteorological work now being done in Peru is being carried on by the Astronomical Observatory of Harvard College. Harvard's astronomical and meteorological work in Peru is the result of a bequest left to the Harvard College Observatory by the will of Mr. Uriah A. Boyden, in 1887. By the terms of the will this money was to aid in the establishment of an observatory "at such an elevation as to be free, so far as practicable, from the impediments to accurate observation which occur in the observatories now existing, owing to atmospheric influences." In order to determine the best site for the new observatory, it was necessary to make a more or less careful study of the meteorological conditions, especially as affecting the visual conditions, at various places which seemed to promise well. Accordingly preliminary stations at which astronomical and meteorological work was temporarily carried on were established in 1888 and 1889 in Colorado and in California. It was, however, thought advisable, for various reasons, to place the new observatory within the tropics, and accordingly an expedition was sent out in 1889 to make a study of the meteorological conditions, and of the availability for astronomical work, of various places along the west coast of South America. There is, as is well known, along this coast a narrow strip of desert, which extends roughly from latitude 4° to 30° S., over the greater part of which rain seldom or never falls. This desert strip, about 1,800 miles in length from north to south, is probably best known to scientific men, and to the world at large, as containing the rich nitrate fields of northern Chili, which were seized by the Chilians in the late war with Peru. These nitrate deposits which have, since the war, furnished the greater part of the revenues of Chili, are essentially a product of the dry climate of this interesting region.

The expedition above referred to was in charge of Professor Solon I. Bailey, of the Harvard College Observatory, and reached Lima on March 6, 1889. After a survey of the surrounding country it was finally decided to place a temporary station on a summit about 20 miles northeast of Lima, at an altitude of 6,600 feet above sea-level. This summit, which had previously been unnamed, was called Mt. Harvard. Meteorological observations on Mt.

*SCIENCE, N. S., Vol. VI., 1897, p. 134.

†The Geology of Massanutten Mountain in Virginia. Published by the author. Washington, 1897. See p. 33.

Harvard were made from May, 1889, to September, 1890, inclusive, and embraced those made with standard, maximum and minimum thermometers, rain-gauge, barograph and thermograph, sunshine and pole-star records.

Owing to the approach of the cloudy season and to the consequent difficulty of carrying on work with the meridian photometer, Professor Bailey and his party left Mt. Harvard in November, 1889, in order to spend the succeeding cloudy months in a study of the meteorological conditions of other parts of the coast farther south, with a view to selecting the most favorable site possible for the location of the permanent observatory. On this trip Arequipa was visited and a study made of its availability as a site for the observatory. Farther south, Pampa Central, in the desert of Atacama, was visited and a system of observations of cloudiness started, which were continued (thrice daily) from December 14, 1889, to August 23, 1890. In this region there is absolutely no vegetation, not even the cactus growing there. Pampa Central is in a rich nitrate field, and is distant from the Pacific Ocean about 80 miles, its altitude being 4,530 feet above sea-level.

In October, 1890, Arequipa having then been chosen as the permanent site for the observatory, the Mt. Harvard station was given up. The exact site of the observatory was chosen by, and the buildings erected under the supervision of Professor Wm. H. Pickering, who came to Arequipa in January, 1891, and remained in charge of the station for two years. Since that time Professor Bailey has been in charge.

The meteorological observations above referred to, made at Mt. Harvard and at Pampa Central, were not the first made in Peru under the auspices of the Harvard College Observatory. By means of correspondence carried on in 1887 and 1888 Professor E. C. Pickering had already been able to establish four meteorological stations, at which observations were begun in November, 1888, viz.: Mollendo, Arequipa-Vincocaya and Puno. At Arequipa observations have been continued from that date down to the present time, and at Mollendo they were continued until 1896, when the station was removed to Mejia, a neighboring town, close to sea-level on the Pacific Ocean. At Puno the observations were discontinued in March, 1889, and at Vincocaya in November, 1890. All these places are on the line of railway running from Mollendo, on the Pacific, to Puno, on Lake Titicaca, at an altitude of 12,540 feet. The whole length of the line is 325 miles. Vincocaya, at an altitude of 14,360 feet, was, at the time when observations were there made, the highest meteorological station in the world. It is situated on an extensive level plateau, barren except for some sparse desert vegetation, and is very near the crest of the western range of the Cordillera, the highest point on the line of the railway being at Crucero Alto, 14,666 feet, a short distance east of Vincocaya. The instruments used at Vincocaya were maximum and minimum and dry-bulb thermometers, rain-gauge, wind-vane and thermograph, and observations were also made of cloudiness. At Puno, situated towards the western end of Lake Titicaca, no thermograph was in operation.

The meteorological stations at present at work under the auspices of the Harvard College Observatory in Peru are the following: Mejia, La Joya, Arequipa, Pampa de los Huesos, Mont Blanc, Misti Summit, Cuzco and Echarati. These stations are roughly in a S.-N. line, and extend from the seacoast across both ranges of the Cordillera and down to 3,300 feet, in a valley at the head of the Amazon river system. A brief description of these stations, and of the instruments in operation at each one, may be of interest. The station at Mejia has, since January, 1896, replaced that which had existed at Mollendo from 1888 through 1895, and as the two places are near together, and have similar topographic surroundings, the continuity of the records has not been seriously interfered with. Mejia is situated on the Pacific, 9¼ miles from Mollendo, the port of Arequipa and the terminus of the railroad. The instruments are 55 feet above sea-level and 420 feet from the sea. The surrounding country is extremely desolate, there being only the most scanty vegetation, except where irrigation is possible. Behind Mejia there is a range of hills, barren and unattractive, and all around it there is an abundance of

drifting white sand, which gives the whole region a most inhospitable appearance. The instruments at Mejia are the dry- and wet-bulb and maximum and minimum thermometers, rain-gauge, wind-vane, Pickering sunshine-recorder, barograph, thermograph and hygrograph. Observations are made thrice daily, at 8 a. m., 2 and 8 p. m., and include, besides the records of the instrumental reading, observations of clouds (kind, position, amount) and of wind velocity (estimated). This seacoast station is especially valuable as giving data concerning the climatic conditions of the desert belt, where its climate is modified by the proximity of the ocean.

The next station inland from Mejia is at La Joya, a railroad station distant from the ocean about 40 miles, and situated in the center of the elevated pampa of Islay, at an altitude of 4,141 feet above sea-level. This pampa lies east of the coast range of mountains, and is almost completely devoid of vegetation. It is surrounded by hills, and is very largely covered, towards its eastern margin, with the curious traveling sand crescents known as *medanos*, which move across the desert from south to north, in the direction of the prevailing day wind. These *medanos* are composed of white sand, apparently quite different from that which makes up the rest of the desert surface, and they are a very striking feature of the landscape. The meteorological conditions at La Joya are very interesting, and the records will furnish abundant data for the study of what we may call *desert meteorology*, which would include such characteristically desert phenomena as mirages and dust whirls. The instruments at La Joya are similar to those at Mejia.

The central station is at the Observatory, in Arequipa. Arequipa is situated at a distance of about 80 miles, in a direct line from the Pacific Ocean, and lies on both sides of the river Chile, the water from which is extensively used in irrigating the neighboring fields. Although the surrounding pampas can support only scant vegetation, the city itself lies in the midst of green fields of wheat, barley, Indian corn and *alfalfa*. The Observatory is built on high land overlooking the city, and stands at an elevation of 8,050 feet above sea-level, being about 500 feet above the city. Its exact location is lat. 16° 22′ 28″ S.; long. 4 h., 46 m., 12 sec. To the north, about 12 miles distant, rises Charchani, 20,000 feet high; to the northeast, 10 miles away, is the Misti, 19,200 feet; and to the east comes the serrated ridge of Pichu-Pichu, an extinct volcano, 18,600 feet high. Arequipa, at a considerable distance from the ocean, and in close proximity to several high mountains, presents meteorological conditions, a study of which is peculiarly interesting. Observations are made at 8 a. m., 2 and 8 p. m. daily. The instruments in use are the following: Wet- and dry-bulb, maximum and minimum, solar- and terrestrial-radiation thermometers; mercurial barometers, rain-gauge, anemometer and anemoscope, Pickering sunshine recorder, barograph, thermograph and hygrograph. The observations include, in addition to readings of the instruments, tri-daily records of clouds (kind, position and amount), and of the visibility of the three neighboring mountains. Earthquake records include two observations daily of the seismograph and seismoscope, and two daily records are also made of changes in the level of the ground.

The fourth station, still farther inland, is on the so-called Pampa de los Huesos, about 30 miles northeast of Arequipa, at an elevation of 13,400 feet above sea-level. This pampa is composed of volcanic sand and ashes, and is almost completely barren. There being no possibility of securing an observer in this desolate region, readings of the wet- and dry-bulb thermometers are made whenever a visit to the shelter is possible, at which times, also, the sheets of the barograph and thermograph are changed.

On the flank of the Misti above the Pampa de los Huesos, at a height of 15,700 feet, is the fifth station, known as 'Mont Blanc,' because the altitudes of this station and of that on the summit of Mont Blanc are almost exactly the same. The 'M. B.' shelter, as it is called for brevity, is at a distance of about 300 feet from the hut where observers from Arequipa, on their way to visit the meteorological station on the summit of the Misti, spend one night. The instruments are wet- and dry-bulb and maximum and minimum thermometers, thermograph and barograph; and this station is visited, as is that

on the Pampa de los Huesos, when an expedition is made to the summit.

The most interesting of all the meteorological stations in Peru—indeed, the most interesting meteorological station in the world, because it is the *highest in the world*—is that on the summit of the Misti, at an altitude of 19,200 feet above the level of the sea. This was established by Professor S. I. Bailey in October, 1893. The shape of the Misti is that of an almost perfect, although more or less truncated cone, and the conditions of exposure of the instruments are as nearly perfect as it is possible to obtain on a mountain. The instruments now in use on the summit are dry- and wet-bulb and maximum and minimum thermometers, rain-gauge, barograph, thermograph and hygrograph. There is also a meteorograph, constructed by Fergusson, of Blue Hill Observatory, especially for this station, and designed to record temperature, pressure, humidity, and wind direction and velocity, and to run three months without re-winding. This meteorograph has not yet given as complete records as it was originally hoped would be obtained from it. For some months after its establishment the Misti station, together with the Huesos and Mont Blanc stations, was visited by one of the assistants in the Observatory once in ten days, but lately not more than one visit a month has been possible. The trip is by no means an easy one, and the altitude of the Misti is so great that almost every one going there suffers from *soroche*, or mountain sickness. The writer has twice visited the 'highest meteorological station in the world' during his present stay in Peru, and both times had some experience in the unpleasant symptoms of *soroche*. Although it has thus far been impossible, in view of the great altitude and the distance of the station, to secure complete and continuous records from it, still the broken records which have been obtained are so interesting that this, to a considerable extent, makes up for their fragmental character.

The seventh station is at some distance farther north, at Cuzco (lat. 13° 30′ 55″ S.; long. 74° 24′ 30″ W., approximately), lying in a valley between the eastern and western ranges of the Cordillera, at an elevation of 11,378 feet above sea-level. It is rather an interesting fact that here, in the ancient capital of the Incas, a North American university should be maintaining a meteorological station. Cuzco is at present distant from Arequipa five days' journey; two days being spent in the train, one in a vehicle and two on horseback. The instruments are wet- and dry-bulb and maximum and minimum thermometers, rain-gauge, wind-vane, Pickering sunshine recorder, barograph and thermograph.

The last station, the farthest from Mejia, is Echarati, on the eastern slopes of the eastern ranges of the Cordillera, and in the fertile valley of the Urubamba, about 130 miles north of Cuzco. Echarati is at present just at the outer limits of what may be called civilized Peru, for a short distance beyond it comes a wild territory, inhabited altogether by Indians, through which white men seldom pass. When first established, in 1894, the shelter was at Santa Ana, about 30 miles nearer Cuzco, but last year the instruments were removed farther north, to their present location. The equipment is the same as at Cuzco. The altitude is 3,300 feet.

A glance at a good map of Peru will show at once what a magnificent series of stations Harvard has thus established in this hitherto meteorologically unknown country. Reaching from sea-level across the desert pampa of Islay to Arequipa, they continue on up past 13,400 and 15,700 to 19,200 feet, and then down, towards the north, to 11,378 feet and finally to 3,300 feet. The line of stations thus cuts diagonally across the desert belt of Peru and extends through a region of increasing rainfall down to the well-watered valley of Urubamba, which belongs to the Amazon water-shed. That the large number of observations already collected in Peru, and now being tabulated for publication, will furnish data of the greatest interest and value is a foregone conclusion.

R. DeC. Ward.

Harvard College Observatory,
Arequipa, Peru, December 1, 1897.

THE CRUSTACEAN GENUS SCYLLARIDES.

While looking into the anatomy and nomenclature of the Astacoidean crustaceans, I in-

cidentally learned that the only species of *Scyllarus* known to Fabricius* in 1775, when he first made known that genus, was the *S. arctus* —the *Cancer arctus* of Linnæus. That, being the only species, is necessarily the type, and, therefore, the name *Scyllarus* must be retained for it. The early carcinologists (Latreille, White) correctly recognized the type. Nevertheless, the *S. arctus* was taken as the type of a new genus—*Arctus*—and the name *Scyllarus* was reserved for the "*Sc. sculptus, latus, squamosus, equinoxialis, Haanii, Sieboldi*," by Dana in 1852. He was doubtless influenced in this respect by the consideration that the *arctus* was the only species of its genus known to him, while most belonged to the other one. All succeeding carcinologists have followed him, and, indeed, the family is one of the very few for which a classification proposed nearly half a century ago has been retained intact to the present time, new species only having been added meanwhile. However, the necessity for a change will be recognized by almost every zoologist, and the sooner it is made the better it will be. I, therefore, propose to restore *Scyllarus* to the typical species, and to give the new name *Scyllarides* (*Scyllarus* with the Greek patronymic termination *-ides*) to the bereft genus. *Scyllarides* may be typified by the *S. æquinoctialis* (*Scyllarus æquinoctialis* of Nicolaus Tönder Lund).†

According to Dr. Ortmann (Zool. Jahrb., Syst., 268, X., 1897), there are five well defined species of *Scyllarides—squamosus, latus, haani, æquinoctialis* and *elizabethi*.

THEO. GILL.

WASHINGTON.

LAMARCK AND 'A PERFECTING TENDENCY.'

PROFESSOR JOHN GARDINER has done well to recall the fact that the chief factor in evolution, according to Lamarck, is not the so-called 'Lamarckian factor,' but '*a perfecting tendency*.' Lamarck's Histoire Naturelle is in perfect accord with his Philosophie Zoologique, as interpreted by Professor Gardiner. Lamarck thus describes his two factors: (1) '*Composition progressive*,' '*progression*,' '*plan de la nature*,' "*pouvoir qui tend sans cesse à compliquer l'organisation, à accroître le nombre et le perfectionnement des facultés*," "*cause première et prédominante*." (2) "*La cause accidentelle n'ayant pu altérer la progression en question, que dans des particularités de détail, et jamais dans la généralité des organisations*."

The editors of the second edition of the Histoire Naturelle add a foot-note (Vol. I., p. 114) which concisely states Lamarck's position: "Il y a donc, d'après Lamarck, deux causes toujours agissantes sur les animaux, l'une qui tend à les perfectionner d'une manière uniforme dans leur organisation, l'autre modifiant irrégulièrement ces perfectionnements, parcequ'elle agit selon les circonstances locales, fortuites, de température, de milieu, de nourriture, etc., dans lesquels les animaux vivent nécessairement."

Lamarck repudiates the '*échelle graduée*' of Bonnet, and claims there is no identity between it and his '*composition progressive*.'

C. O. WHITMAN.

*Systema Entomologiæ, p. 413, 1775.

†The proper authority for the species (generally known as '*S. æquinoxialis* Fabr.') has been given by Miss Rathbun in the Annals of the Institute of Jamaica (I., 43). The excellent memoir of Lund (Om Slægten Scyllarus < Skrivter af Naturh. Selskabet, II., p. 17-22, 1793) has been ignored by almost all others. It was referred to by White, but the references to Lund were mostly given after those to Fabricius.

SCIENTIFIC LITERATURE.

Recent and Coming Eclipses. By SIR NORMAN LOCKYER, K.C.B., F.R.S. Macmillan & Co. 1897.

This volume, consisting mainly of articles which have appeared from time to time in current periodicals, is issued with a view to supplying the general reader with information regarding the latest phases of the chief eclipse problems.

The treatment divides itself into two parts. The earlier chapters of the work contain elementary explanations of the theory of eclipses, and that of the instruments used in their observation. The spectroscope in its various forms is discussed in detail, and much stress is laid on the efficiency of the slitless spectroscope or 'prismatic camera.' The application of this

instrument to many of the problems of solar physics is dwelt upon at length. A chapter is also devoted to the various simple observations which can be made without the use of elaborate apparatus. Following this preliminary discussion is an account of the eclipse expedition to Kiö Island, with a description of the arrangement of the camp and apparatus, and an account of the development of the latent observational powers of the officers and crew of H. M. S. 'Volage,' which had been detailed to assist in the expedition. Then comes the story of clouds, failure and the retreat. A chapter is now devoted to the success at Novaya Zembla, where Mr. Shackleton succeeded in obtaining the spectrum of the chromosphere by means of a prismatic camera. This finishes what has been referred to as the first part of the work.

What follows is devoted to the bearing of eclipse observations up to date upon the question of the composition and distribution of the solar atmosphere. It is stated that the 'flash spectrum' of the chromosphere is radically different from the ordinary absorption spectrum with which we are familiar, and that therefore the chromosphere is not the seat of most of the absorption. Comparisons are made with arc and spark spectra and that of 'hot stars' with a view to showing that the chromosphere is hotter than the absorbing media, which must therefore be situated higher up in the solar atmosphere. The step from this proposition to dissociation is a short one, and, with the satisfied conclusion that "The eclipse work strengthens the view that chemical substances are dissociated at solar temperatures," the author closes his book.

In brief, it may be said that the features of the work are the stress laid upon the importance of the prismatic camera in eclipse work, the account of the volunteer corps of the 'Volage,' and the exposition of the vindication of the dissociation hypothesis by all the phenomena of solar and stellar spectroscopy.

While there is no denying the fact that in the slitless spectroscope we have one of the most powerful instruments for the prosecution of eclipse work, it seems doubtful whether it will accomplish all that our author, its warmest advocate, expects from it. It is hoped to get a definitive spectrum of the corona, by means of subtracting from the spectrum of the *whole eclipse*, obtained with an integrating spectroscope, that portion which is due to the chromosphere alone. This latter is to be determined by the prismatic camera. It is not impossible that a line might be common to both chromosphere and corona, but shine so feebly in the latter that its presence would be masked by the continuous spectrum. In such a case the line would be assigned to the chromosphere alone. It would, therefore, seem as though the true solution of the problem is to be expected from the slit spectroscope, part of the slit being made to lie on the moon's shadow In order to make such an attack complete many parts of the corona should be covered. With an instrument of the probable dimensions of that described by Sir Norman Lockyer the field of the collimator should be flat enough to allow several images of the sun to be used. These could be twisted by means of reversion prisms so that any portion of the corona could be brought upon the slit. In this manner the regions surrounding the sun could be well commanded.

It will be seen that in the case of the integrating spectroscope the full efficiency can not be developed, as the central part of the lens will be covered by the dark cone of the moon. Again, and this is more or less in the same line of argument, the brightness of a line will be an average of the brightness of that color over the entire field, while with the instrument provided with a slit we have maxima and minima, which is important in the case of faint lines. For these and other reasons it seems doubtful whether the great power the instrument described might not be used to better advantage in some manner other than the one proposed.

It is expected, by means of the prismatic camera, to decide between the two contending hypotheses regarding the distribution of gases in the solar atmosphere. Do the vapors all rest upon the photosphere, and thin out at different heights, or are they arranged in concentric layers? One of the methods suggested is as follows, to quote Sir Norman Lockyer: "There is a very definite way in which the photographs taken with the prismatic camera may indicate the presence of layers of vapors concentric with the photosphere, but not reaching down to it.

At a certain height above the photosphere the chromosphere spectrum in a photograph of the chromosphere visible at any one instant beyond the edge of the moon will show arcs of certain relative intensities. As the moon advances and gradually uncovers the base of the chromosphere the same arcs will remain visible, but those produced by a layer which does not extend down will be reduced in intensity as compared with arcs produced by vapors which do reach lower down; the latter will continue to get brighter, while the others remain at the same absolute intensity. As the lowest part of the chromosphere is shown in the photographs taken immediately after totality, or exactly at the end, it is only necessary to compare the relative intensities of the arcs in different photographs, in order to investigate the general question as to the existence of layers."

Let us now consider what we should be led to expect under the hypothesis that all the gaseous envelopes rest upon the photosphere. There are no grounds for believing that those

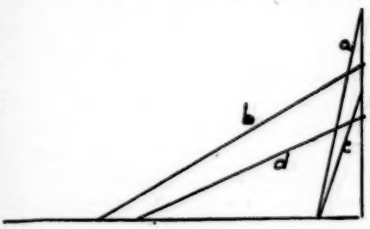

FIG. 1.

gases which extend the highest should be intrinsically the brightest. In fact, we should expect extent and brightness to depend largely upon separate conditions. In Fig. 1 let the ordinates represent the height of a point above the chromosphere, and the abscissæ the brightness of a gas at that point. The lines *a*, *b*, *c* and *d* are supposed to represent the relation between height and brightness of four different gases. For simplicity, and in the absence of definite information upon the subject, these lines are assumed to be straight. If the examination is made close to the photosphere the *effective* intensity of the arc will be proportional to the amount of gas uncovered per unit of length along the moon's edge. Fig. 2 has been roughly sketched to indicate the effective intensity at different levels. Fig. 3 shows the

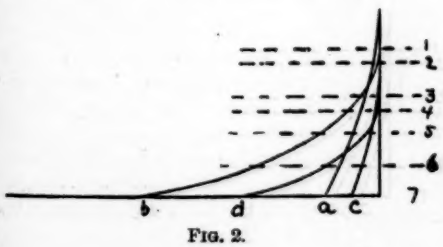

FIG. 2.

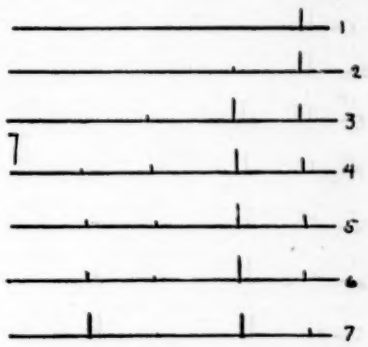

FIG. 3.

relative intensities of the lines at the levels indicated. If the extent of some of the vapors is so great that their arcs have a considerable area the case is still further complicated. If we understand our author aright, a series of photographs corresponding to Fig. 3 would indicate layers *d* and *b* resting on the photosphere, followed by *c* higher up and finally by *a* alone. It is true that a rough scale of *absolute* brightnesses might be built up by comparing the middle of the arc with portions nearer the cusps, but such an arrangement would be only approximate, and is evidently not intended by the author. It is not, therefore, at once apparent that the riddle proposed by the relative intensities of a large number of lines belonging to different gases is easy of solution.

It is with regret that the reader finds throughout the work statements and suggestions to which, perhaps, for a want of comprehension of exactly what is meant, he is forced to issue a

mental challenge. The one just discussed is an example; others might easily be cited, for instance the reasoning leading to the conclusion that prominences are not of the chromosphere and must, therefore, come from the outside. But space forbids further discussion in this direction.

The training of the volunteer corps of H. M. S. 'Volage' was ingeniously planned and carried out with pains. Parties consisting of those fitted for certain classes of work were organized and regularly drilled for some time preceding the eclipse. In training the sketchers, former coronas were thrown on a screen by means of a magic lantern and, after some practice, remarkable proficiency was shown in accurately drawing the objects, within the eclipse interval of time. It is doubtful, however, whether results of value are to be had from drawings of the corona. Since such very short exposures are required completely to fog a photographic plate the question of getting faint outlying details is merely one of contrast, and with skillful exposure and development there seems to be no reason why the camera should not be considered superior to the sketch-book in delineating eclipse phenomena, as it has shown itself to be in innumerable other branches of research.

With regard to the bearing of solar work in general on dissociation, it is safe to say that the consensus of scientific opinion is not with Sir Norman Lockyer. While dissociation is admitted as a possibility, it is not considered that a preponderence of evidence has given it the standing of a scientific fact. It is claimed that for astrophysics there is laid the foundations of an exact science. But as yet the superstructure has not neared completion. Peculiar characteristics of spectra accompany certain physical conditions. Good work has been done in the direction of associating the one with the other, but it is only a beginning. It is doubtful whether most scientists consider that the influence of all our terrestrial conditions upon the spectrum has been determined, or even guessed, to say nothing of those which may exist in the sun and stars. In time to come, when knowledge becomes more definite on some of these points, and the effect of influences probably existing in the sun has been allowed for, we may, with a mental reservation, assign the residual anomalies of solar and stellar spectra to some condition which we suspect to exist. Until then this line of attack is to be followed with caution.

"In the course of the spectroscopic solar investigations which have been going on since 1868 I have had to point out over and over again that the phenomena observed could be more easily explained on the hypothesis that the chemical elements with which we are familiar here were broken up by the great heat of the sun into simpler forms" etc. In the present state of our knowledge it is somewhat of a problem how much of a figure the question of 'ease' should cut. We call to mind the fact that, on account of insufficient experimental data, the phenomena of light were more *easily* explained to Newton by the emission hypothesis than by the wave theory. And we are not all Newtons.

In closing, however, it is to be said that Sir Norman Lockyer has given us an interesting book, one particularly so to the general public. Technical subjects are explained in simple language, and the mere recital of facts and theories has been relieved from time to time by digressions upon subjects of a more human nature. This is particularly so in the account of the 1896 eclipse expedition. It is hoped that the volume will give to amateurs and others who may witness the coming eclipse such a knowledge of some of the problems awaiting solutions as will enable them to make intelligent observations which may be of interest to themselves and of use to science.

W. H. Wright.

Lick Observatory, December, 1897.

RECENT MATHEMATICAL BOOKS.

Famous Problems of Elementary Geometry. An authorized translation of F. Klein's 'Vorträge über ausgewählte Fragen der Elementargeometrie.' By Wooster Woodruff Beman, Professor of Mathematics in the University of Michigan, and David Eugene Smith, Professor of Mathematics in the Michigan State Normal College. Boston, Ginn & Co. 12mo. Pp. ix+80.

Augustus De Morgan, who in his day waged such merry war with the circle squarers, got half the delight of battle from the fact that he had to meet his foes in single combat and pepper them with small shot, a kind of warfare from which he was sure to emerge with joyous triumph and an appetite for more. To chase his prey through a tangle of reasoning had to his versatile mind the zest of a fox hunt. To kill all the foxes at one discharge would have spoiled his sport. Until very recently the circle squarer had one safe retreat. Nobody could logically dispose his general thesis. And, beside, he had philosophic and scriptural authority. A circle is a perfect figure. That which is one span across is three spans around. Even the august Legislature of Indiana was lately beguiled by a *savant* from Hooppole county into enacting that no circle should be *de rigeur* in that State for which the ratio of circumference to diameter was not exactly three and two-tenths. But we have changed all that. The circle squaring fraternity has long had no standing in court, but now a perpetual injunction is out against them. Not only do we now possess a proof of the transcendental nature of the number π, but this proof has been recently so simplified as to be perfectly intelligible at a very early stage of mathematical study.

The mathematical *pi* is inedible without *e*. The modern investigations begin with Hermite's proof of the transcendence of the exponential base in his paper '*Sur la fonction exponentielle*,' *Comptes Rendus*, 1873. Lindemann's celebrated proof of the transcendence of π appeared in the *Mathematische Annalen*, 1882. The connecting step is the establishment of the theorem that in an equation $c_0 + c_1 e^{a} + c_2 e^{b} + \cdots = 0$, the exponents and the coefficients cannot all be algebraic numbers. From Euler's equation $1 + e^{\pi i} = 0$, the transcendental character of π then follows at once. But it was first in 1893 that Hilbert, Hurwitz and Gordan did away with the earlier formidable apparatus and reduced the proof to the present elementary form. The results, together with the modern disposition of the kindred problems of the duplication of the cube and the trisection of an arbitrary angle, have since been made generally available by the publication in book form of Klein's lectures on these subjects. These lectures have already been translated into French and Italian, and we have now, thanks to Professors Beman and Smith, an excellent English version. The present book is well edited and well printed. Every teacher of even elementary mathematics will do well to obtain a copy, not merely for his library, but to be actually read.

The Calculus for Engineers. By JOHN PERRY, Professor of Mechanics and Mathematics in the Royal College of Science, London. London and New York, Edward Arnold. 8vo. Pp. viii+378.

From the title of this book one might naturally expect to find in it a considerable deviation from the prevalent stereotyped treatment of what the author rather deprecatingly calls 'academic' calculus. On inspection, however, the divergence turns out to be about as complete as could well be imagined. The author's aim is to make the methods of the calculus available for the use of students who already have a considerable knowledge of practical physics and mechanics. A great deal can be done in this direction by the aid of a few functions and the simplest rules of differentiation and integration. In the present book the first 266 pages are divided into two chapters, one of which deals, so far as the calculus proper is concerned, with x^n, the other with e^x and $\sin x$. These chapters are filled with an excellent collection of examples drawn from every branch of applied mathematics. To give an idea of the diversity in this regard, I cannot do better than to quote from the index, which is in itself a commendable feature of the book. Under B, which supplies one of the shortest lists in the index, we have: Ballistic effects; Basin, water in; Beams, fixed at ends, of uniform strength, shear stress in, standard cases; Beats in music; Belt, slipping of; Bending, in struts; Bessels; Bifilar suspension; Binomial theorum; Boiler, heating surface of; Bramwell's valve gear; Bridge, suspension. Very many of the examples are of a kind to be very appropriately introduced into the 'academic' books; and considering how completely latter-day writers on

the calculus have plucked Williamson and Todhunter and each other, I recommend a raid on Perry by way of refreshing variety.

Having got his reader fairly into the calculus, the author finally confesses a weakness for the subject and adds a third chapter of 'academic exercises,' in which he treats the subject of the usual text-books, only in a different order and briefly, but nevertheless including differential equations, Bessel's functions and spherical harmonics.

Even the student who has already studied the calculus in the usual systematic form will profit by traversing it with the author; and to the engineer the book must be very useful. The lecture style in which it is written often makes the subject more attractive. It also sometimes carries away the author, in an excess of enthusiasm, into expressions of opinion which are not to be taken too seriously nor yet to be 'skipped,' as the author advises in the cases of difficult passages.

F. N. Cole.

Columbia University.

SOCIETIES AND ACADEMIES.

ZOOLOGICAL CLUB, UNIVERSITY OF CHICAGO, NOVEMBER, 1897.

A New Human Tænia (Tænia confusa, Ward).—The new form has much of the slender appearance and delicate structure of *Tænia solium*, but as regards the size of the proglottids is even larger than *Tænia saginata*. The segments are of almost uniform breadth and very narrow. In addition to a peculiarly constructed head, the worm presents many variations of bodily structure when compared with the ordinary forms. The sexually mature proglottids measure 4–5 mm. long by 3–4.5 mm. wide; the lobes of the ovary are kidney-shaped and two or three times as long as broad; the genital pore is extremely shallow; in all of which respects it differs markedly from either *T. saginata* or *T. solium*. A short distance from the exterior the vagina is provided with a very distinct sphincter muscle. A similar structure was found also in preparations of *T. saginata*. Such a muscle, heretofore, was thought to exist only in other than human Tæniæ. Just before the vagina reaches the receptaculum seminis it becomes highly modified and, unlike that of *T saginata* or *T. solium*, is encircled by a number of small sphincter muscles. As regards the male reproductive system, the testes are smaller than those of *T. saginata*, and a distinct seminal vesicle is present. The terminal or ripe proglottids are of an extreme length, measuring 28–35 mm. long by only 4–5 mm. wide. They never have the peculiar pumpkin-seed shape so characteristic of *T. saginata*, but are of constant transverse diameter, flaring slightly at the posterior end to form a broad base of attachment for the succeeding proglottid. The branches of the uterus number from 11 to 14, and are divided more or less arborescently, resembling those of *T. solium* somewhat in general configuration. The eggs are without pyriform apparatus and measure about 30 by 39 micra. The longitudinal nerves run in strands of from three to five down each side of the body; near the pore the strands separate, part going ventral and part dorsal to the genital ducts. The longitudinal muscles are continuous throughout the body.

M. F. Guyer.

Some Features of the Oögenesis of Sternaspis.—The egg-cells arise in the manner described by Vejdovsky from the peritoneal epithelium of certain blood-vessels, forming a single pair of distinct ovaries, each surrounded by a fold of the peritoneum and opening to the exterior of a distinct oviduct.

As the egg-cell grows a pedicle is formed beneath it, and in this appears a loop of the blood-vessel as described by Vejdovsky. The end of the loop enters the egg-cell.

In early stages the egg-cell contains a large nucleus with prominent nucleolus and reticular cytoplasm. As growth proceeds the cytoplasm begins to assume a radiating structure, centering about the end of the vascular loop. The first yolk-granules deposited appear in the portions of the egg farthest from the point of attachment. The radiate arrangement of the cytoplasm becomes more distinct as yolk is formed, and the region immediately surrounding the vascular loop stains very deeply.

The egg is now pear-shaped, hanging from its stalk with the nucleus in the broader end sur-

rounded by large yolk-spheres. As the egg gradually fills with yolk the cytoplasmic radiations become less conspicuous and shorter. Finally, the egg-cell becomes filled with yolk-spheres, except a small region about the vascular loop, which contains a reticular cytoplasm, from which fine threads pass out among the yolk-spheres. The nucleus is at the opposite end of the oval egg and is almost surrounded by yolk.

Now the vascular loop disappears; the egg, surrounded by its membrane, becomes detached from its pedicle, and the point of attachment becomes the micropyle, lying just over the small cytoplasmic area.

The temporary radiate arrangement of the cytoplasm, resembling in many respects an aster, is apparently closely connected with the deposition of yolk, and with the fact that the egg receives its nutriment from one end, *i. e.*, from the vascular loop.

C. M. CHILD.

Observations on the Cytogeny of Annelids with 'Equal' Cleavage.—Podarke obscura. The segmentation is of the so-called 'equal' type. At the 8-cell stage all the cells are equal in size, and up to the 56-cell stage there are no differences between the quadrants. Five groups of 'micromeres' are formed, which have the same history as the correspondiug groups described for other annelids, but the cells d^2 (x) and d^4 (m) are no larger than the other cells of the corresponding quadrants. The median plane of the embryo forms an angle of approximately 45° with the first two cleavage planes.

Bilateral symmetry in the embryo is produced by the formation of a small cell ($x^{1.2.}$) at the 64-cell stage; by the bilateral division of one of the 4th group of micromeres to form the mesoblast, and by the appearance of a bilateral cross at the upper pole, these two latter divisions occurring immediately after the 64-cell stage. From now on the original radial symmetry is rapidly lost.

A few observations on other annelids follow.

Lepidonotus sp. Here are formed the regular number (5) of groups of micromeres, the cell $x^{1.2.}$, and the bilaterally symmetrical cross.

Sthenolais picta. The cross furrow takes and retains the position characteristic of the other annelids, and the cell $x^{1.2.}$ is formed at the usual time and place.

Hydroides dianthus. Five groups of micromeres appear and one of the 4th group divides bilaterally at the surface (mesoderm?). The primary trochoblasts divide but once, thus forming a primary prototroch of 8 cells instead of 16, as in other annelids.

A. L. TREADWELL.

In addition to the above papers the following reviews of recent literature were given during the month: 'The Yolk-Nucleins in Birds and Mammals' (Mertens), F. L. Charles; 'The Correspondence in the History of the Germ Cells in Plants and Animals' (Häcker), Miss M. M. Sturges; 'The Development of the Excretory System of the Myxinoids' (Mass), Miss E. R. Gregory.

NEW YORK ACADEMY OF SCIENCES—SECTION OF BIOLOGY, DECEMBER 13.

IN a paper entitled 'Considerations on Cell-Lineage, based on a Re-examination of some Points on the Development of Annelids and Polyclades,' Professor E. B. Wilson presented observations regarding the origin and relations of the mesoblast in annelids and polyclades which illustrate the fact of ancestral reminiscence in cell-lineage. In some of the Annelids (*Aricia*, *Spio*, *Nereis* and others) the primary mesoblasts have not been properly so-called; for before giving rise to the mesoblast-bands they bud forth cells that may be, in some cases, traced into the wall of the archenteron. In *Nereis* not less than six or eight such cells are formed; these become pigmented, wander into the interior, and finally give rise to the posterior part of the archenteron. In *Aricia* and *Spio* only a single pair of corresponding cells is formed, and they are so small as to play a quite insignificant part in the building of the body. A comparison of these results with those of Conklin on *Crepidula* indicates that the mesoblastic pole-cells of annelids and mollusks are to be regarded both historically and ontogenetically as derivatives of the archenteron, and that the rudimentary cells of *Aricia* and *Spio* are

vestiges or ancestral reminiscences of such origin.

A re-examination of the cell-lineage of a polyclade, *Leptoplana*, shows that, as in the annelid or gasteropod, all of the first three quartets of micromeres give rise to ectoblast, while the second quartet gives rise also to mesoblast, each cell of this quartet segmenting off three ectoblast-cells and then delaminating a large mesoblast-cell into the interior. The third quartet apparently gives rise to ectoblast alone, though the possibility of its producing mesoblast is not excluded. The four macromeres remaining give rise to the archenteron, as Lang describes, first dividing to form four basal cells (corresponding in origin and position with the four basal entomeres of annelids and mollusks) and four much larger upper cells which correspond to the fourth quartet of micromeres in annelids and mollusks. The posterior of these cells always divides before the others, sometimes equally and symmetrically, as in *Discocœlis* (Lang), but more often unequally. The cells thus formed give rise to a part of the archenteron and not, so far as can be determined, to mesoblast.

These observations show that the mesoblast of polyclades is of ectoblastic origin, and they suggest that the origin of mesenchyme-cells from the second (*Unio*, *Crepidula*) or third (*Physa*, *Planorbis*) quartets in gasteropods may be a vestige or ancestral reminiscence of the mesoblast formation in the polyclades. They suggest, further, that the mesoblast-bands (entomesoblast) of annelids and mollusks may have been historically of later origin than the mesenchyme (ectomesoblast)—a view which harmonizes, broadly speaking, with that of Meyer—and that the two symmetrical entoblast-cells, into which the posterior member of the fourth quartet divides in the polyclade may represent the prototypes of the entomesoblasts of the annelids and gasteropods.

Mr. Crampton briefly reviewed his observations on the early history of the egg in *Molgula manhattensis*, as follows: The author emphasized the fact that development begins not with the cleavage or fertilization processes, but even before. From the origin of the primary oocyte until the final assumption of the adult form, there is a continuous series of developmental changes, each stage being based upon the preceding one and conditioned by it.

The growth of the primary oocyte and the formation of the yolk were considered at some length. A true 'yolk-nucleus' arises, as the author believes, from the nucleus, and this by continued growth, and later by fragmentation, gives rise to very small spherules which later, by enlarging, form the yolk-spherules. The yolk-nucleus is an albuminous body closely allied to, if not identical with, the yolk or deutoplasm. This was indicated by a large number of microchemical tests. The yolk-nucleus at a very early stage of the egg was also shown to be the only albuminous body in the cell, for the rest of the extra-nuclear part of the cell is almost exclusively composed of pseudo-nucleinic substances. Evidence was cited which indicated that the yolk-nucleus was formed by the nucleus, and that it enlarged by constant additions to it from the nucleus.

The more important results of a study of the maturation and fertilization processes might be briefly stated, although a fuller account will appear in the published paper. The first maturation spindle arises entirely from the germinal vesicle. It is peculiar in that it is barrel-shaped and does not, as far as can be determined, bear at either end centrosomes or asters. The first polar-body receives sixteen chromosomes, while sixteen remain in the egg. The second maturation spindle is also barrel-shaped and is also devoid of centrosomes and asters. Eight chromosomes remain in the egg. The sperm entrance was described and evidence was brought forward to show that the centrosomes of the first cleavage figure were derived from the sperm.

The spindle of the first cleavage figure appears to be formed from the segmentation nucleus, there being no 'central spindle' extending between the centrosomes. The spindle itself was shown to be barrel-shaped, the daughter chromosomes reforming into a vesicular nucleus at the ends or heads of the barrel. A 'zwischen-korper' also arises, as in the maturation stages, by a concentration of the spindle fibres at the equator of the figure. After the reformation of the daughter nuclei, and after division of the cell-body, the paired daughter centrosomes and asters diverge. The

daughter nucleus later moves up between the asters and prepares for the next division. Comparative independence and parallelism of the processes undergone by the centrosomes and asters, on the one hand, and those of the nuclei, on the other, become very strongly probable. Detailed evidence in support of the above points will be given in the published paper.

GARY N. CALKINS,
Secretary of Section.

TORREY BOTANICAL CLUB.

THE first paper of the evening was by Mr. Marshall A. Howe, 'The Genus Anthoceros in North America,' and was illustrated by drawings and specimens. The paper, which will soon appear in print, described three new species and reviewed those before known. Mr. Howe also indicated the intermediate position of Anthoceros between the Hepaticæ and Musci. The antheridia arise within the thallus as nowhere else among Bryophytes; and the archegonia finally become immersed within the thallus, though not endogenous in origin. The sporophyte differs from all other hepaticæ in having stomata and assimilative tissue on the capsule wall, in the presence of continued growth at the base, and in the elongated two-valved capsule. By the bryologist C. F. Austin, of Gloucester, N. J., the cognate genus Notothylas was united with Anthoceros; but it lacks stomata and differs in the form, direction and position of its capsule. Austin's herbarium was sold in England, and now belongs, in part, to the bryologist Pearson, and in part to Owens College, Manchester.

Discussion by President Brown and others followed. Dr. Underwood remarked that he had known Notothylas spores, unlike those of Anthoceros, to germinate without resting-period. *Anthoceros lævis* he finds among the hemlocks at the Botanic Garden at Bronx Park, and elsewhere in moist, flat, sandy and grassy land, fruiting August to November. In California, said Mr. Howe, they occur on banks and in springy places, beginning to fruit in February and shrivelling in May. One of the new species of the California coast is found by Mr. Howe to develop curious globose storage-bodies serving as food-reservoirs to carry the plant over the dry season.

The second communication was by Dr. T. F. Allen, entitled, 'Contributions to the Japanese Characeæ,' composed, in fact, of four papers, soon to be printed, descriptive mainly of certain Japanese Nitella forms displaying interesting correspondences with our own. Dr. Allen then exhibited numerous mounted specimens and etchings and discussed the taxonomic characters. Spore-characters, though important, are not to be relied on exclusively. Measurements of any one species prove very constant. In some the form of the mucro terminating each ray is decisive. The spores afford specific characters both by their arrangement and their markings, as shown by the $\frac{1}{12}$ or $\frac{1}{15}$ immersion lens. Their reticulations are very constant. The spirals which invest the spore are very early formed from the five bracts which form a cup about it and soon become spirally twisted, as all parts of the Characeæ do, and as the protoplasm current does even before its cell has become twisted. Discussing their life-history, Dr. Allen said that the Characeæ increase in part by nutrition dependent on absorption from their radicals. Pluck a Chara with the greatest care to avoid breaking these short unicellular roots, and yet the plant will finally die after the lower cells have yielded up their contents toward the maintenance of the others. *Chara coronata*, the finest of all in showing circulation, survived in his aquarium half a year without any rooting. *Nitella flexilis* will, however, root in the aquarium, seed, germinate and make a protonema, which divides immediately into an upward ray-bearing axis and a descending root-bearing portion.

In answer to remarks by Dr. Underwood and by Professor Burgess, Dr. Allen described the peculiar increase of the plant by absorption of water and by decomposition of sulphuretted hydrogen, occluding oxygen. The spore-shell, formed by thickening and calcareous development of the cell-walls of the enveloping bracts, hardens so as to survive as part of the rock through several geological periods. The aberrant genus Colcochæte among green algæ suggests the Characeæ, in tending to form a spiral around a spore. Chara resembles certain other

algæ, as some Polysiphonias, in forming a cortex by developing a layer of cells on its surface. The latter small cells absorb mineral matter, especially silica and lime. The Characeæ are important purifiers of water by means of this surface absorption. They are also interesting as examples of the great length to which it is possible for a single cell to develop—sometimes reaching 12 feet.

EDWARD S. BURGESS,
Secretary.

MEETING OF THE AMERICAN CHEMICAL SOCIETY.

THE regular meeting of the New York Section of the American Chemical Society was held on Friday evening, Jannary 7th, at the College of the City of New York, Dr. Wm. McMurtrie presiding.

Mr. G. E. Stone exhibited samples of manganese alloys of the following composition:

	Spiegel.	White.	Gray.
Total carbon	4.92	4.45	3.98
Graphitic carbon	.....	2.43	3.14
Silicon	1.94	1.51	3.25
Manganese	11.00	11.00	11.00
Phosphorus	0.04	0.04	0.04
Iron, sulphur, etc., difference	82.10	80.57	78.59
	100.00	100.00	100.00

The alloys are characterized by great hardness and strength, as compared with ordinary pig irons.

Mr. P. C. McIlhiney described a method of determining the resistance of electrolytes having the advantage of making readings at very short intervals. The more accurate method of Kohlrausch requires two minutes between readings, while by the method described a reading may be made every five seconds, which was necessary in the work for which the method was devised.

Professor Loeb gave a very exhaustive review of the speculations in regard to variations of the atomic weights, the theories of condensation, of the 'meta' elements and of ideas in regard to simpler forms of matter. He protests against the notion that any simpler conditions would result from assuming that all elements are a form of one element, and considers that the acceptance of a reasonable number of forms of matter is a decided advantage.

Miss Hitchcock reported experiments showing that nitrogen was given off from tungsten and molybdenum oxides when reduced in a current of hydrogen. On lowering the temperature the amount of nitrogen decreased and increased on again raising the heat. Argon and helium were not found. The results obtained on other oxides indicate that nitrogen is generally present and is considered as a cause of obtaining low atomic weights by the reduction method. Further results are promised.

DURAND WOODMAN,
Secretary.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE eighteenth anniversary meeting of the Biological Society of Washington, D. C., was held on the evening of January 7th. The subject of the presidential address, by Dr. L. O. Howard, was 'A Great Experiment in Economic Entomology: The Work of Massachusetts against the Gipsy Moth.' Both the practical and biological aspects of the work were considered. The address will not be published in full, but the practical portion will appear in Bulletin 10, New Series, Divison of Entomology, United States Department of Agriculture. The biological portion comprised a consideration of the interesting points which have developed in the course of the work of the committee of the State Board of Agriculture for Massachusetts, under the direction of the entomological adviser, Professor C. H. Fernald. The points especially considered were the analyses of the caterpillars fed upon arsenical poisons, the experiments upon rate of travel, amount and character of food, effects of starving, of heat and cold upon the larvæ, the occurrence of hermaphroditism, of polygamy and polyandry with the adults, the experiments upon the eggs, especially as to the effects of heat and cold, and the very important and interesting work done on the assembling of the adults. More detailed consideration was given to the biological interest attaching to the work as a whole, as an attempt to exterminate a species existing under the most favorable circumstances over a considerable extent of country.

F. A. LUCAS.